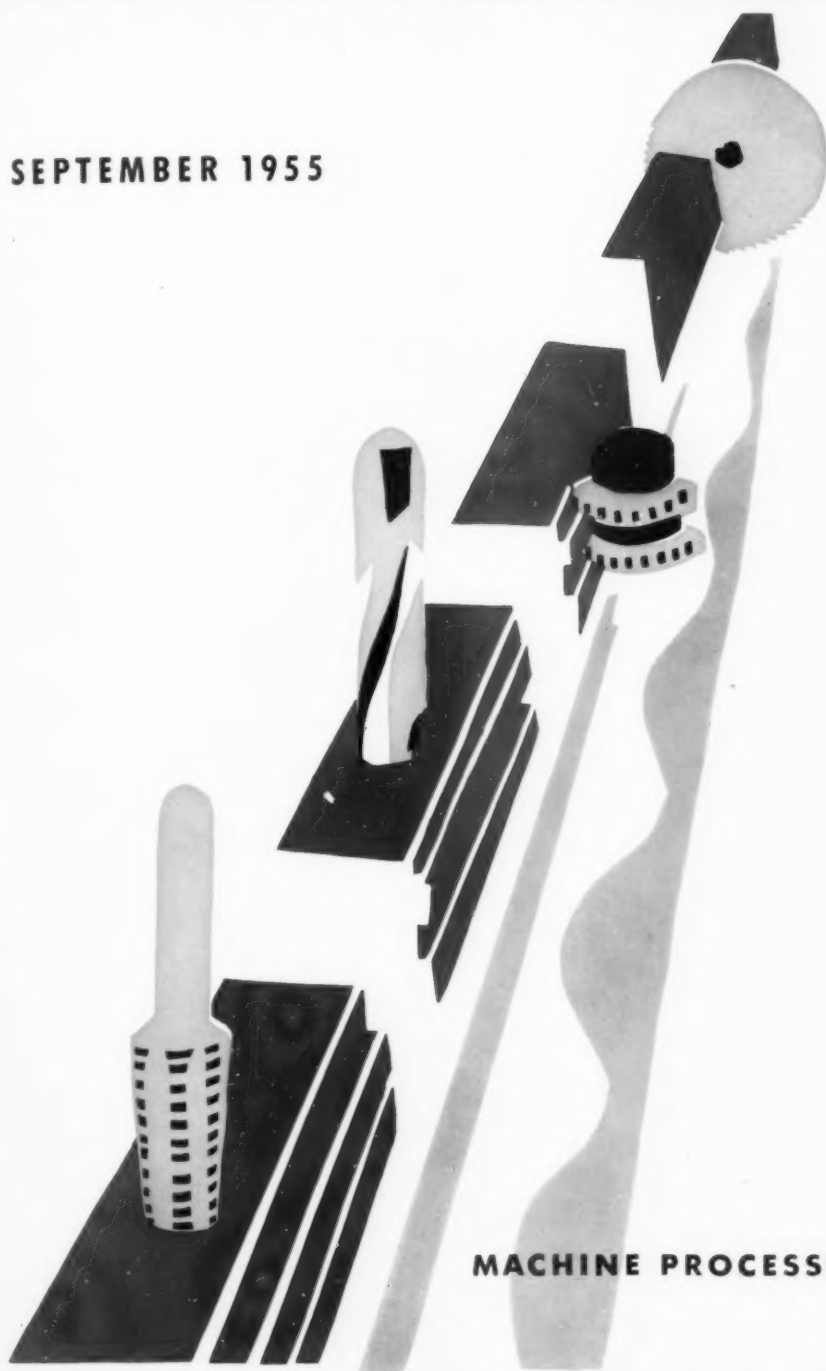


THE TOOL ENGINEER

SEPTEMBER 1955

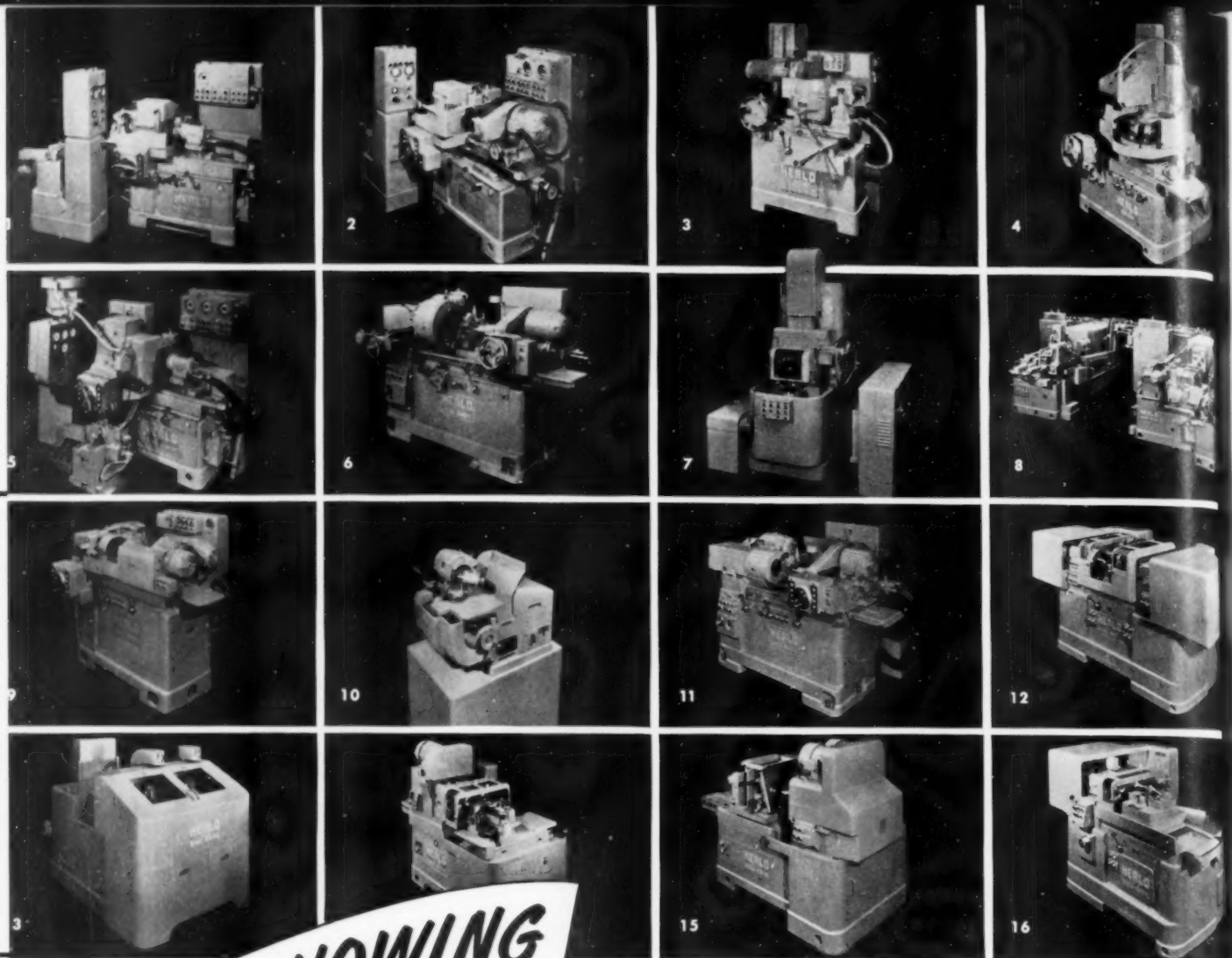


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PUBLICATION OF THE AMERICAN SOCIETY OF TOOL



ENGINEERS



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- 13 **Model 242 Bore-Matic** Vertical spindle mechanical cam-slide unit.
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These new Heald developments represent the latest advances in precision finishing methods and equipment. They offer new opportunities for increased production, improved product quality and lower manufacturing cost per part.

All of these units are on display at the Heald exhibit — all in actual operation on production parts. Here you can see the tremendous progress that has been made in the productive efficiency of Heald borizing, internal grinding and rotary surface grinding equipment. You'll see why *now*, more than ever before, **IT PAYS TO COME TO HEALD.**

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over: Basic machining processes of sawing, milling, drilling and tapping are illustrated as progressive operations on a workpiece. They are typical of those discussed in the group of articles, "Developments and Achievements in Machine Tool Processes," beginning on page 85.

THE TOOL ENGINEER



The Tool Engineer

Volume XXXV, No. 3

September 1955

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PLANNING · ENGINEERING · CONTROL · TOOLING · EQUIPMENT · PRODUCTION

THE TOOL ENGINEER is regularly indexed in the
Engineering Index Service and the Industrial Arts Index



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The Tool Engineer

We Salute!

A tool engineer without tools would soon join the dodo bird in extinction. A tool engineer with obsolete tools would become obsolete too; it would just take longer. Fortunately, tool engineers in America are backed up by companies that believe Henry Ford's admonition that "if you need a new machine and don't buy it, you pay for it without having it."

News of recently developed tools and accessories travels fast by word of mouth, in the pages of the technical press and through manufacturer's announcements but nothing can replace seeing a tool in action. No second-hand report can compare the utility of a new tool with that of tools and methods already in use in individual plants.

Every tool engineer owes it to himself and his company to go to Chicago this month and see for himself the latest equipment, tools, accessories and auxiliaries for production. With three concurrent shows, Chicago will cover most phases of production.

Because it would be impossible to adequately cover one, let alone three, such shows, this issue of THE TOOL ENGINEER represents instead a salute to the entire machine tool industry. With constantly improving tools available from this industry, the function of tool engineering retains vitality and interest.

Extent of the vitality and ever-changing picture of tools and their uses can be seen in eleven articles starting on page 85. These articles, authored by men who know machines, materials and processes, can prepare the show-goer for what he will see and will let the stay-at-home know what he is missing. They are a salute to the builders and the users of machine tools.

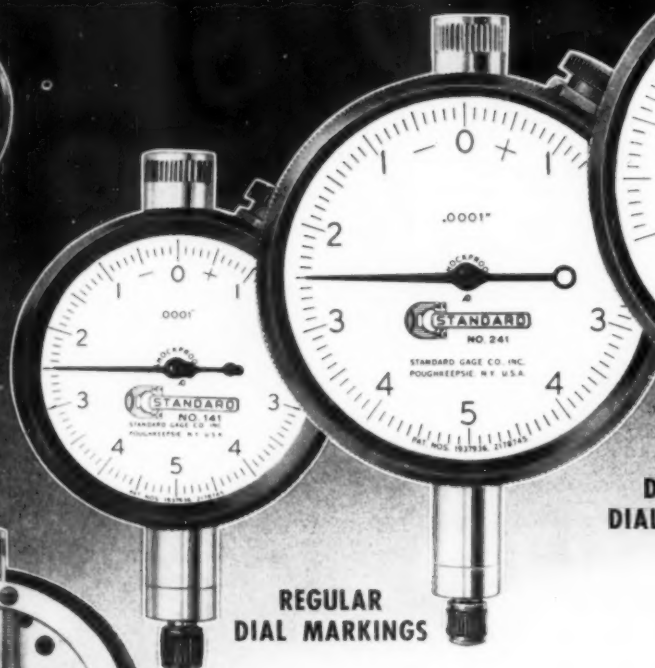
Robert A. Wason
ASSOCIATE EDITOR





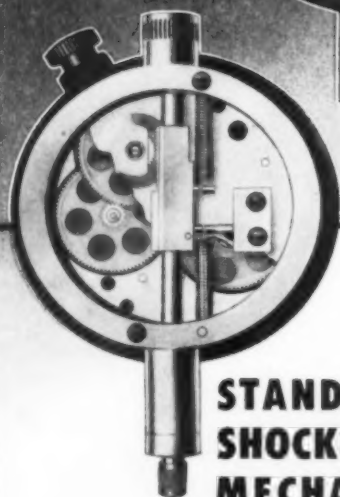
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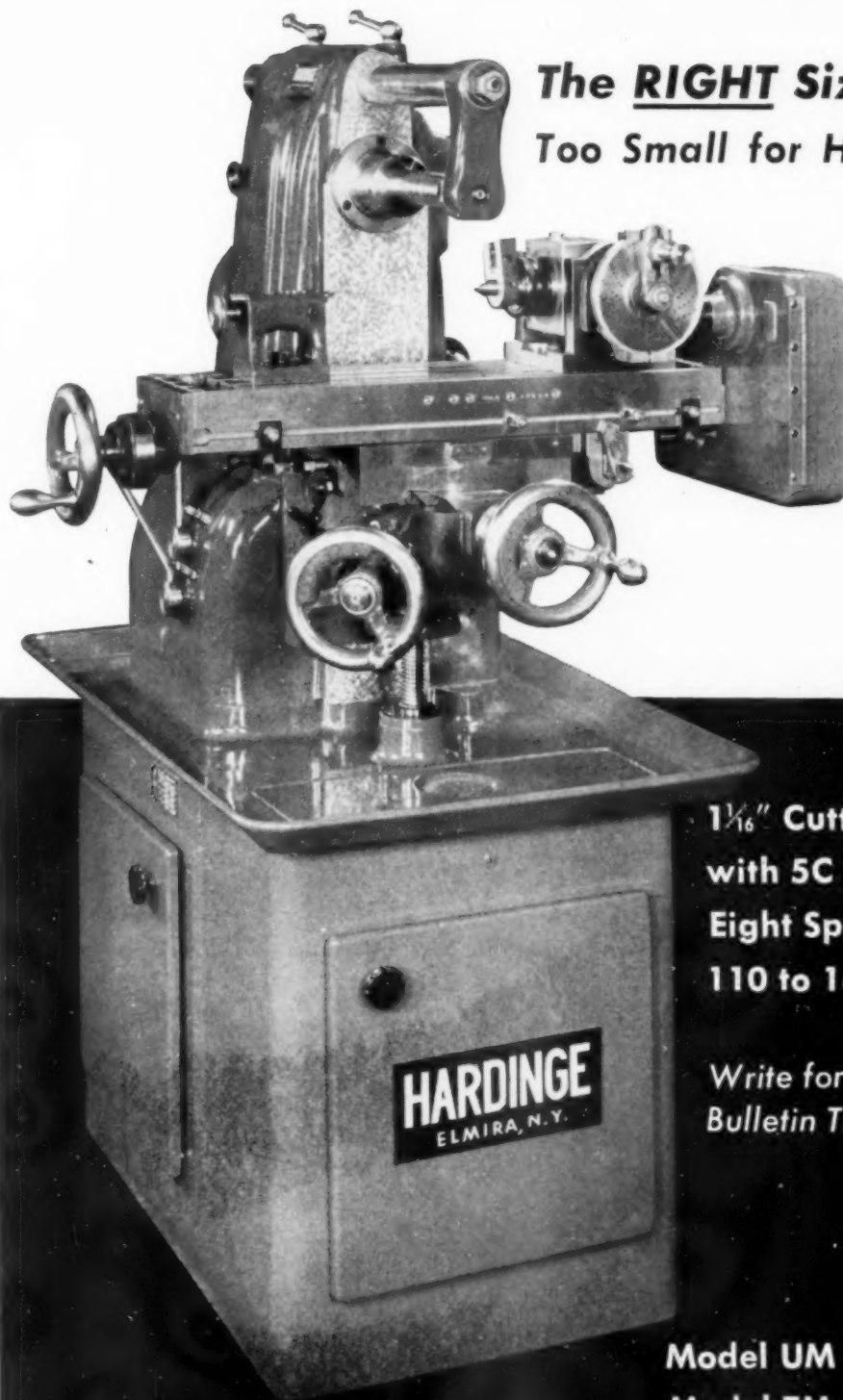
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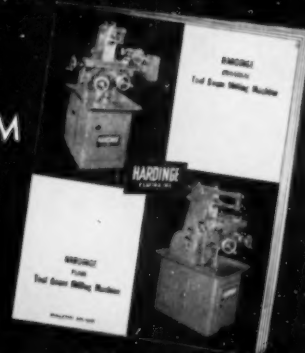
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September 1955

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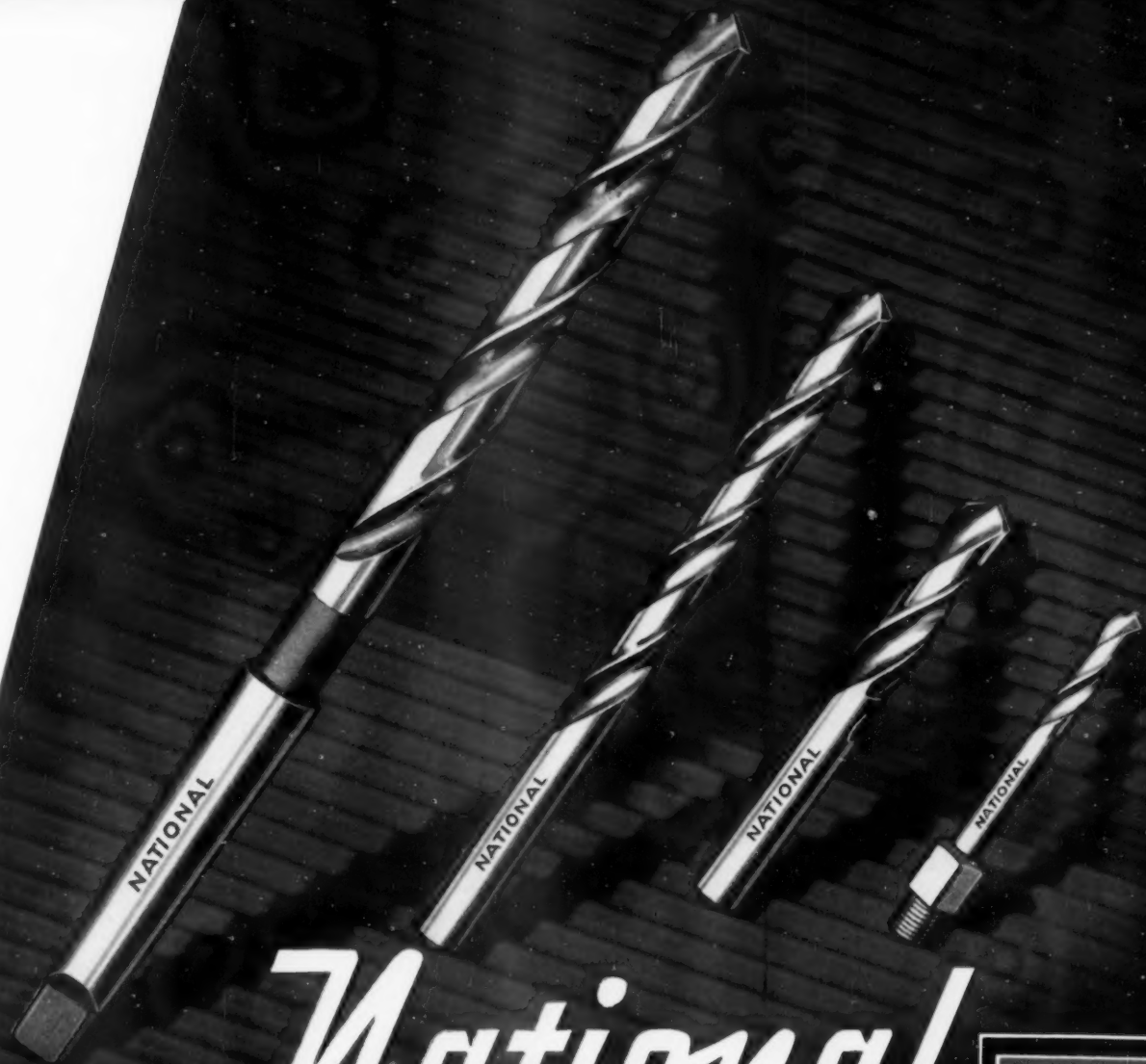
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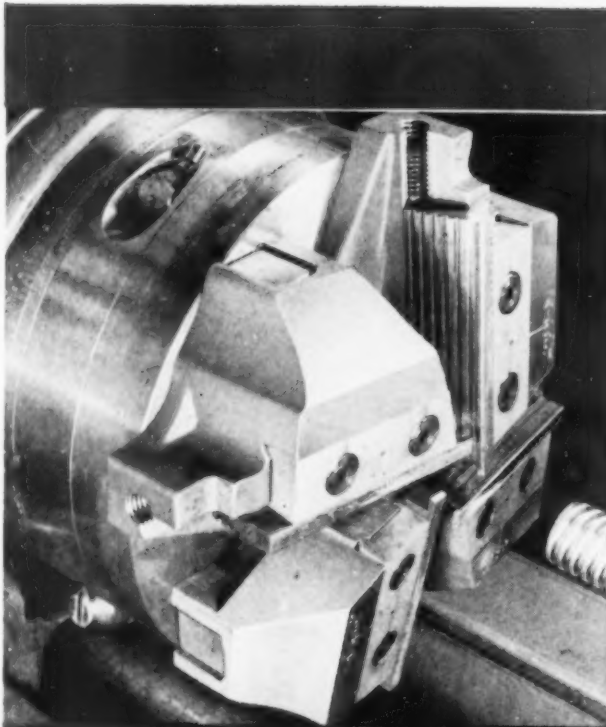
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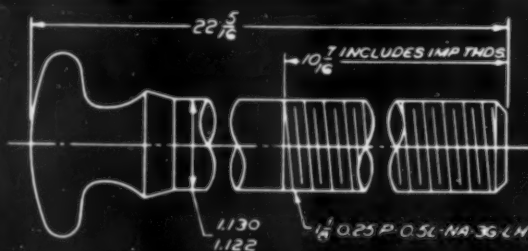
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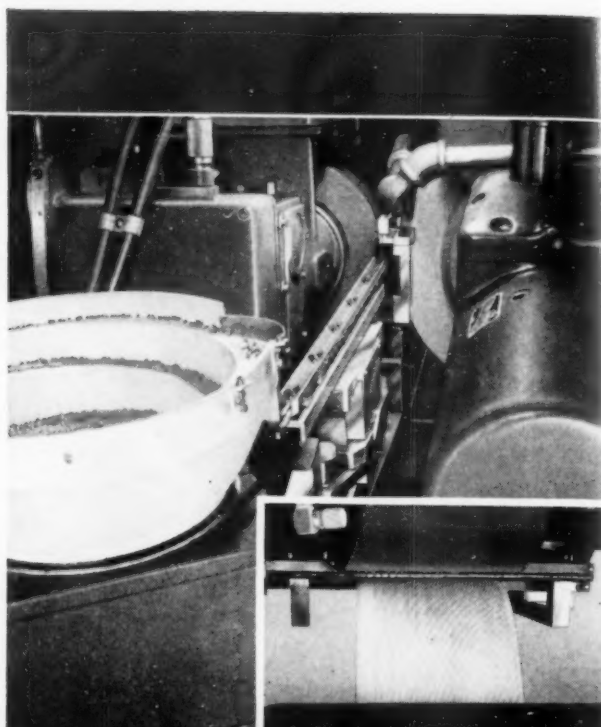


Cutting

Workpiece:	Valve Stem
Thread Spec.:	
Diameter	1-1/8"
Length	10-7/16"
Type	1/4" P, 1/2" lead, double left-hand Acme
Tolerance	Class 3
Threading Time:	24 sec.

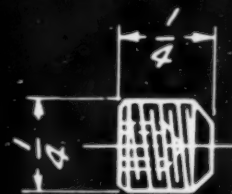


Threading is by the new 16C LANDMACO Single-Spindle Leadscrew Threading Machine fitted with 2" LANCO Heat-Treated Head using Roughing and Finishing Chasers with Centering Throats. This equipment is designed to produce a thread of excellent finish despite heavy metal removal, and eliminate the out-of-roundness common in long workpieces. Long life between grinds of the LANDIS Tangential Chasers for 80% of their length will hold tool cost to a minimum.

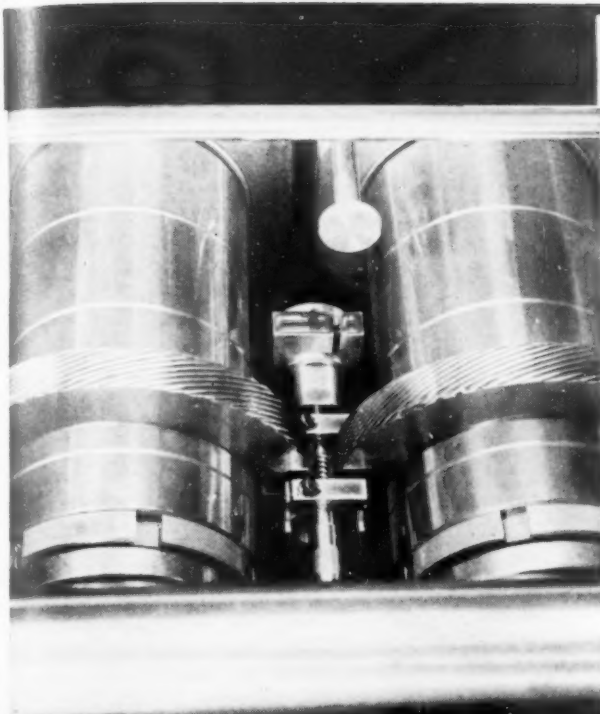


Grinding

Workpiece:	Set Screw
Thread Spec.:	
Diameter	1/4"
Thread length	1/4"
Type	20 P.U.N.C.
Tolerance	Class 3
Production:	7,500 pieces per hour

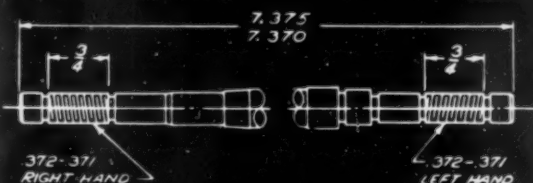


Threading is performed by continuous thru-feed grinding on a #1 LANDIS Centerless Thread Grinder. Operation is automatic—blanks are fed by a vibratory hopper—finished pieces ejected into a tray. This operation indicates the mass production possibilities of the centerless thread grinding method. Infeed grinding may be used for many shouldered workpieces which may not be threaded satisfactorily by either Cutting or Rolling.

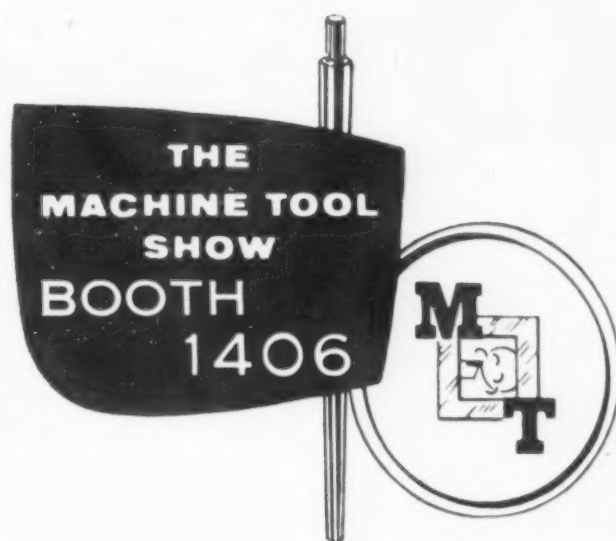


Rolling

Workpiece:	Worm shaft (50 carbon alloy steel of 25 Rockwell C)
Thread Spec.:	
Diameter	3/8"
Length	3/4"
Type	Triple worm, .100" P, .300" lead
Tolerance	.003 concen. with main bearing journals
Production:	12 pieces per minute



Threading is done by infeed rolling with manual loading on the new LANHYROL Thread Rolling Machine. This operation illustrates the difficult threads which can be rolled. Automatic feeding is available for many operations—thrufeed rolling of Acme Threads on long bars also to be demonstrated.



CUTTING, GRINDING, AND ROLLING THREADS will be demonstrated on the most modern Threading Equipment. 3 of the more than 10 Threading Operations to be shown are illustrated. All of the Threading Machines featured in these operations will be on display for the first time: the LANHYROL Thread Rolling Machine, the Model C LANDMACO Threading Machines, and the #1 Automatic Close Nipple Machine. LANDIS Threading Tools—Die Heads, Collapsible Taps, and Thread Rolling Attachments—will also be shown. Experienced LANDIS Engineers will be glad to help with any problem dealing with method, equipment, or thread design.

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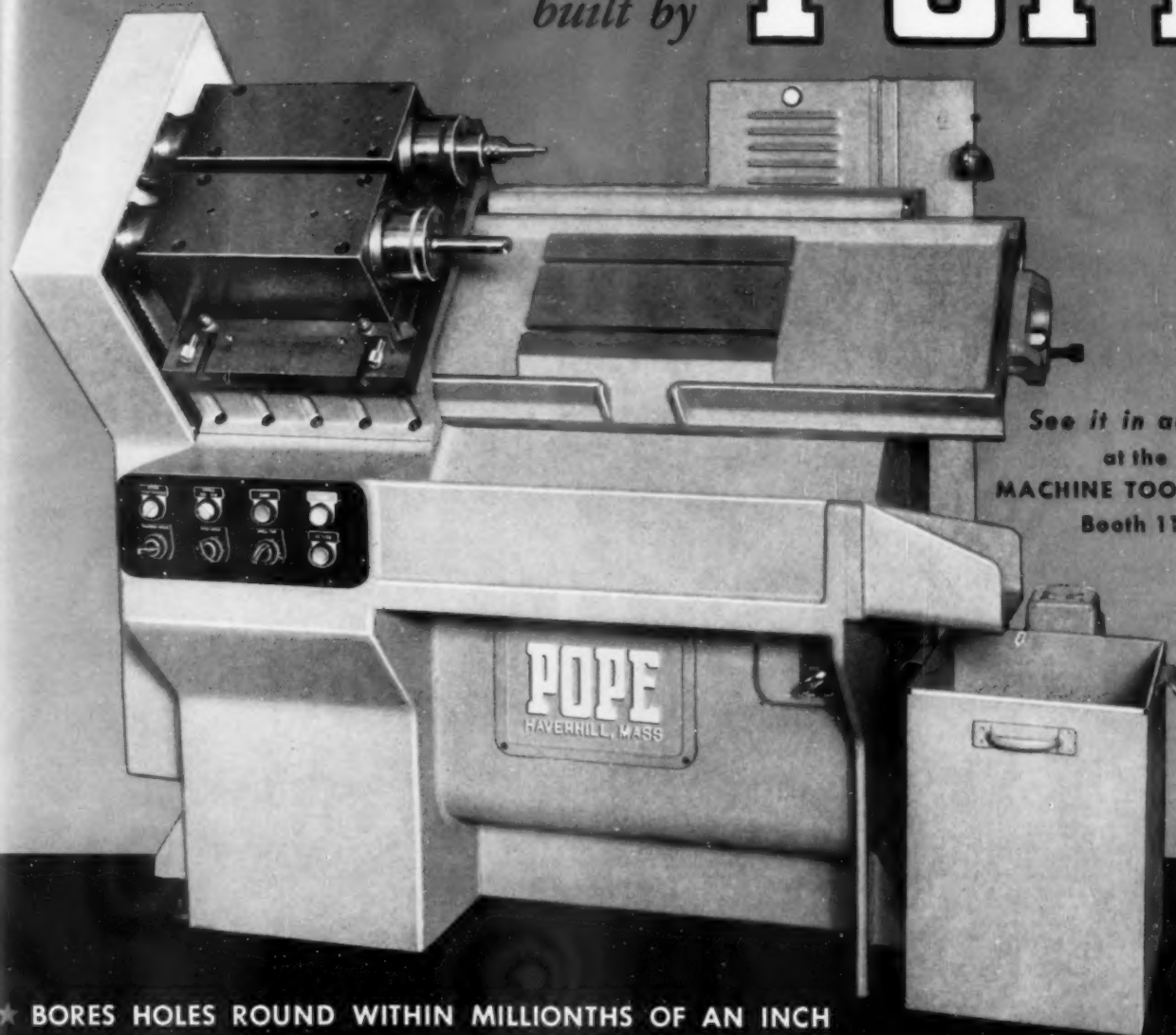
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For the very latest design in simplicity and versatility —

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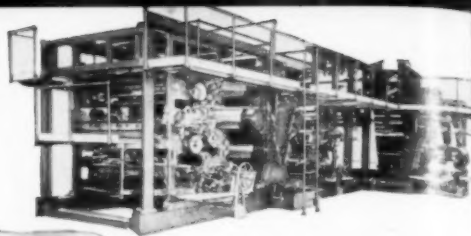
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POPE MACHINERY CORPORATION

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a long reach...

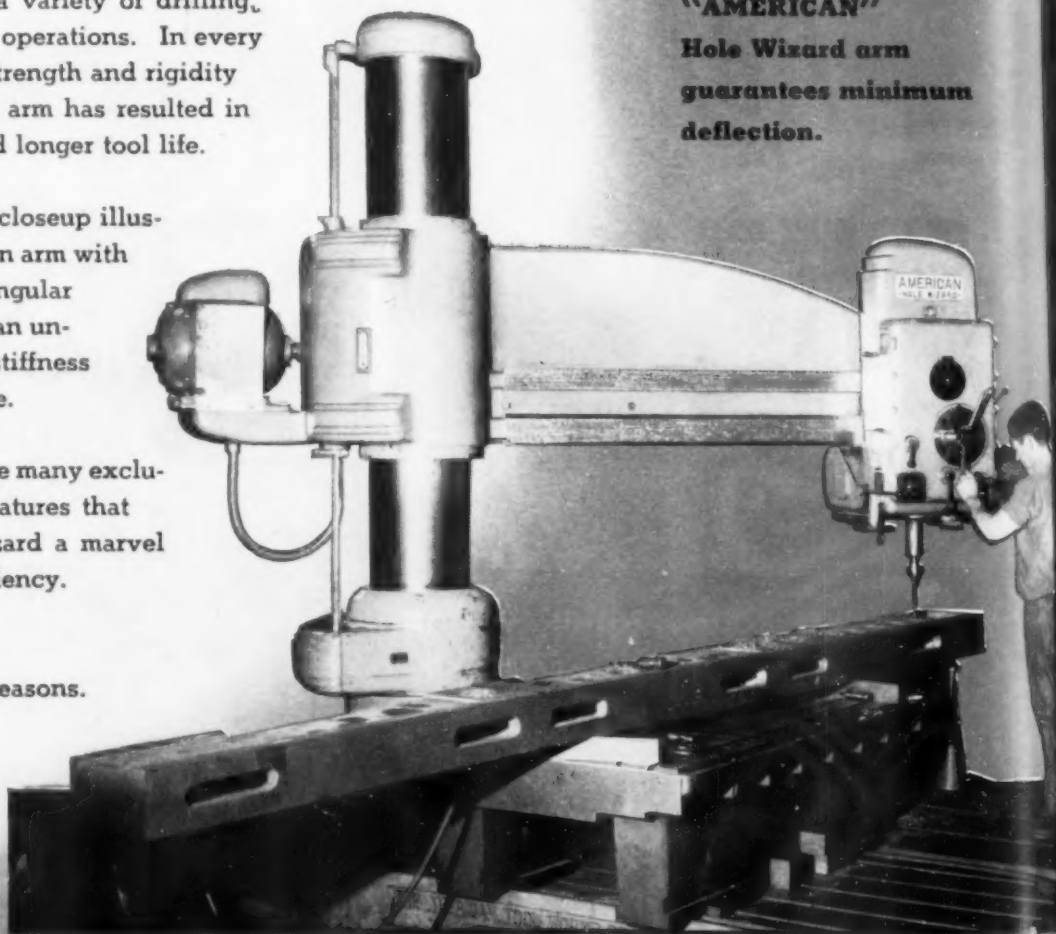
The Cottrell Company, world famed for multi-color printing press manufacture, relies on a 7' arm, 17" column "AMERICAN" Hole Wizard Radial for a variety of drilling, tapping and boring operations. In every instance the extra strength and rigidity of the Hole Wizard arm has resulted in greater accuracy and longer tool life.

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tells you all the reasons.

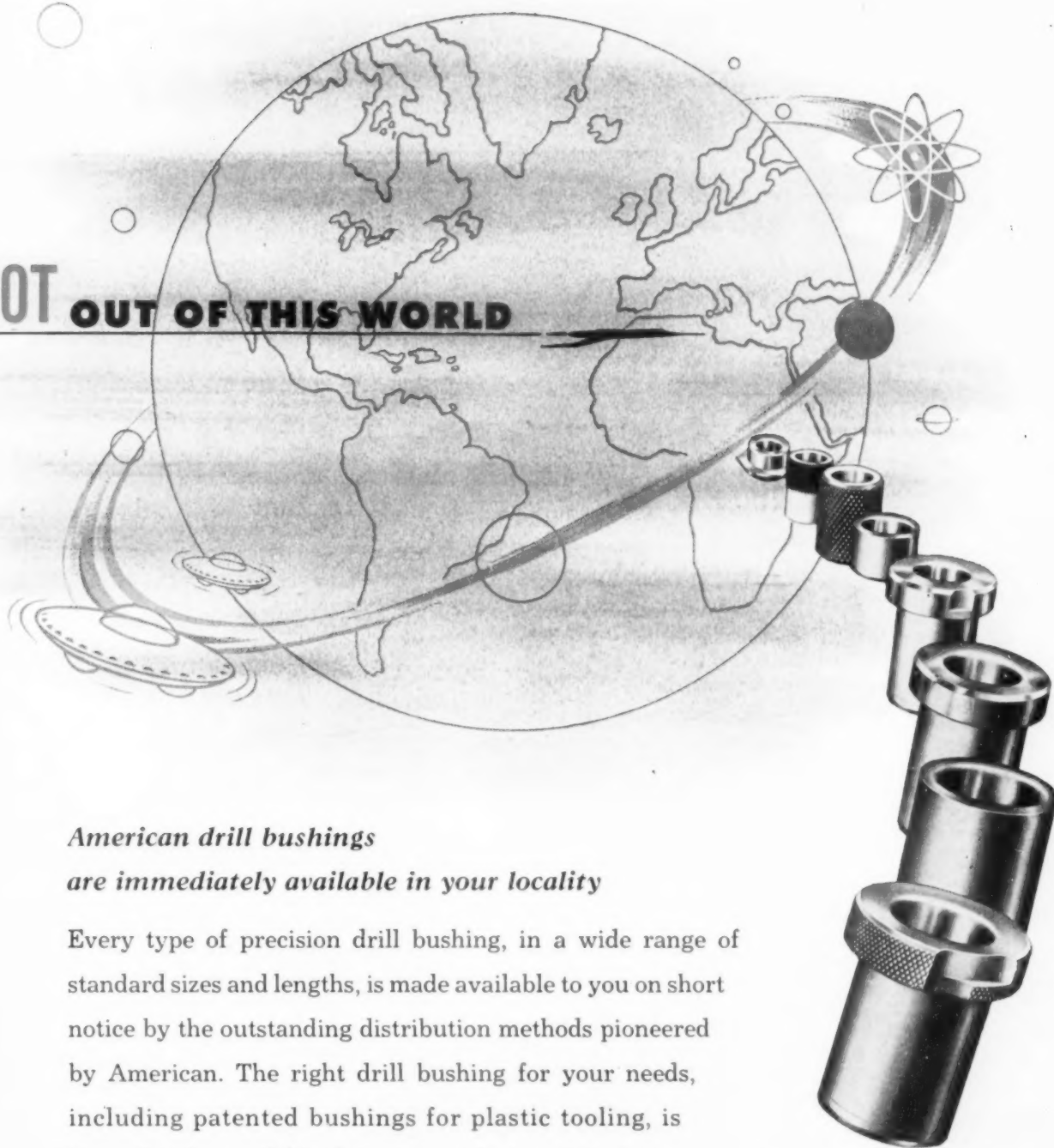
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but the super-
stiffness of the
"AMERICAN"
Hole Wizard arm
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deflection.**



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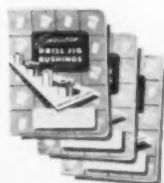
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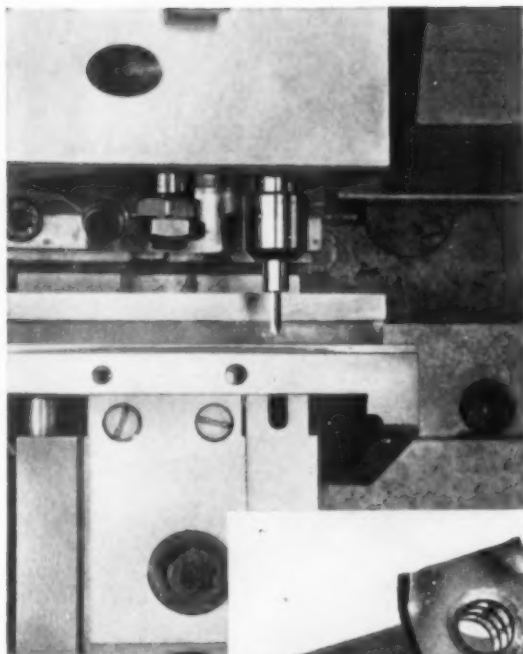
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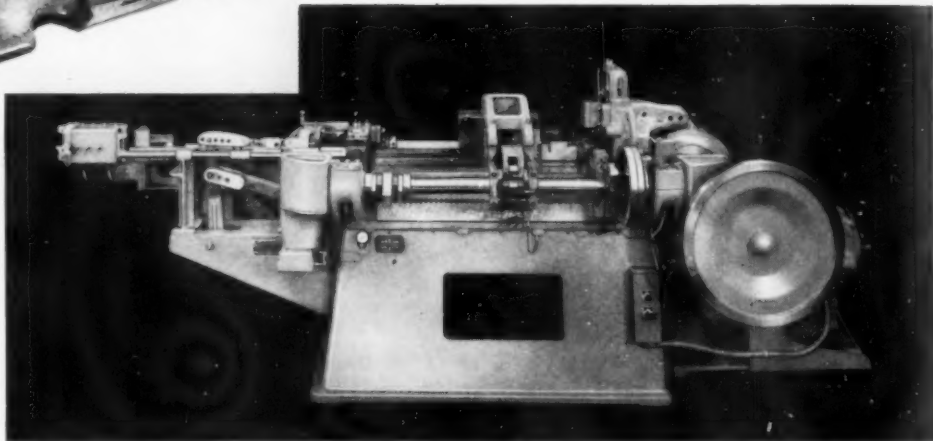
DRILL BUSHING CO.
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Los Angeles 58, Calif.



Top: Close-up top view looking down into tapping position on the U. S. Multi-Slide.

Above: Allen-Bradley Coil Terminal produced complete on No. 33 U. S. Multi-Slide, including tapping a 6-32 hole. Shown about three times actual size.

Right: Standard No. 33 U. S. Multi-Slide Machine which is used (with the addition of a tapping head) for the production of the part shown above.



See this equipment in operation at BOOTH 215, MACHINE TOOL SHOW, International Amphitheatre, Chicago, Ill., September 6-17, 1955.



The Allen-Bradley Company of Milwaukee, Wisconsin, manufacturers of quality motor controls, will install in their plant a No. 33 U. S. Multi-Slide Machine equipped with a tapping head to produce the Coil Terminal shown above *complete including the tapping of a 6-32 hole*. The incorporation of tapping in the U. S. Multi-Slide eliminates the need for a secondary operation on this part.

The U. S. Multi-Slide is designed and built for the automatic production of stampings, and any or all of the following operations may be incorporated to produce complete parts at each stroke of the machine: trimming, piercing, swaging, embossing, blanking and forming. Now the possibility of including a tapping operation further increases the versatility of the Multi-Slide, and offers to the user increased potential for cost reduction by eliminating secondary operations and handlings.

Bulletin No. 15-T contains complete specifications. Write for a copy.

U.S. TOOL COMPANY, Inc.

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LAPOINTE BROACHING MACHINE

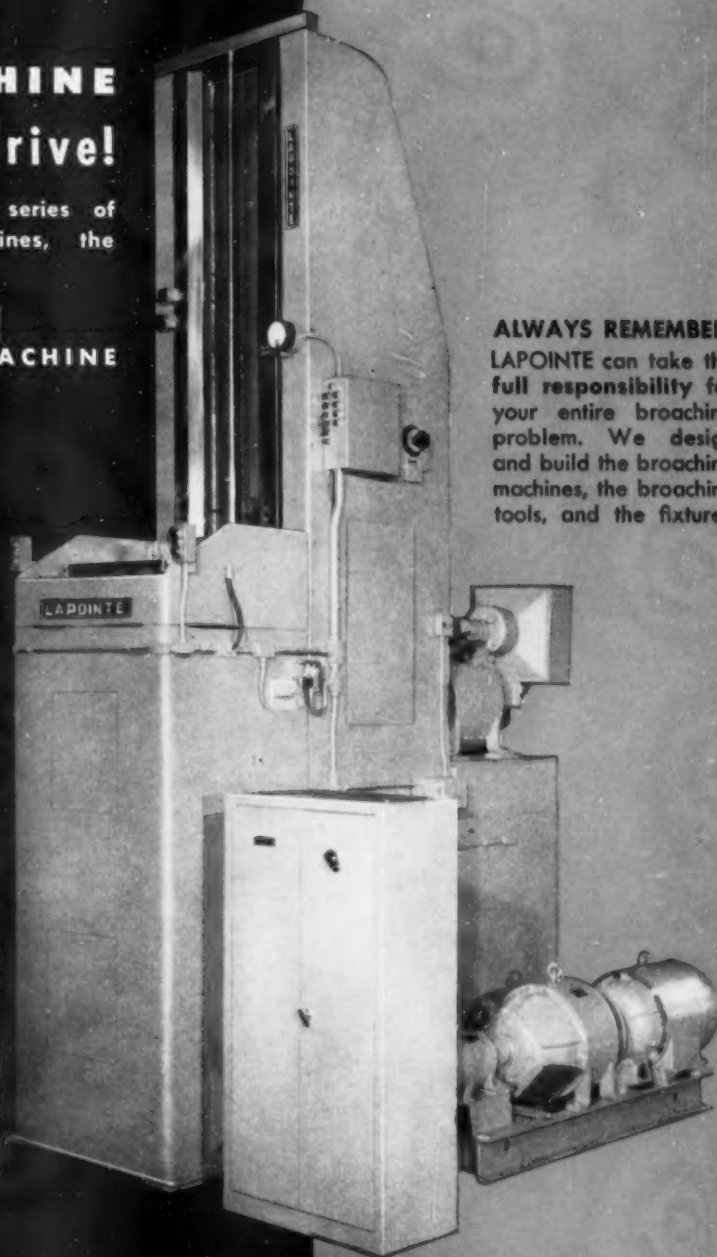
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and a new slide.

Built with a massive, rugged frame and
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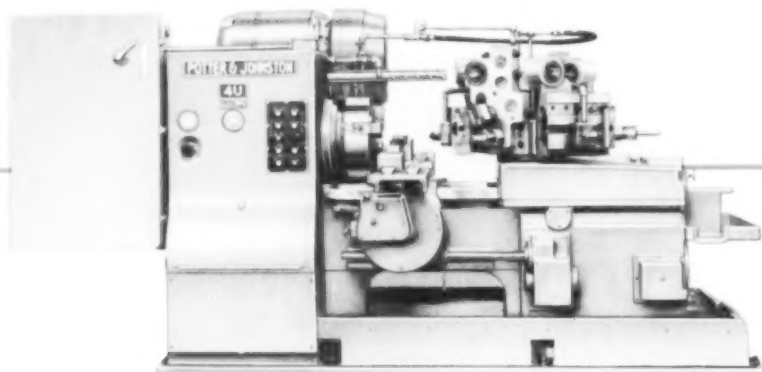
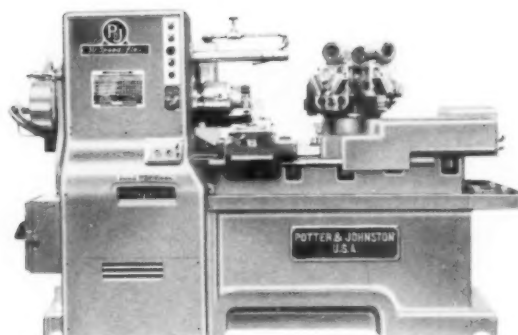
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CHUCK SIZES

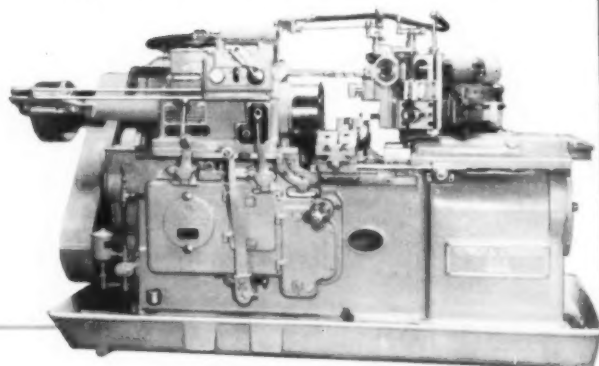
6" - 8"



4-D AUTOMATICS

Made in two sizes, Standard and
Elevated, with spindle speeds to 696 rpm.

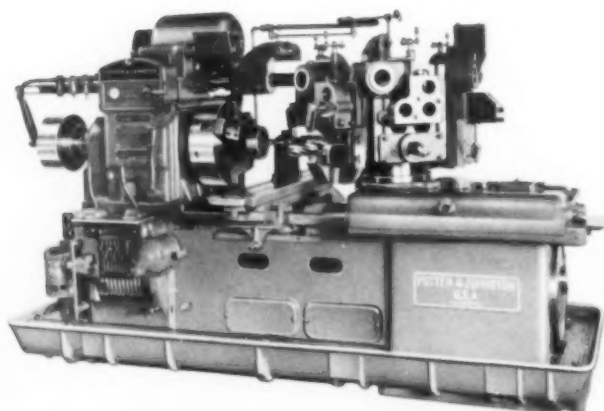
CHUCK SIZES 10" - 12" - 15"



4-U AUTOMATIC

A rugged workhorse with extra
power for fast metal removal
with carbide tooling. Spindle
speeds to 1177 rpm.

CHUCK SIZES 10" - 12" - 15"



5-D POWER-FLEX

Available in three sizes; Standard,
Elevated and Elevated with Long
Travel; spindle speeds to 610 rpm.

CHUCK SIZES

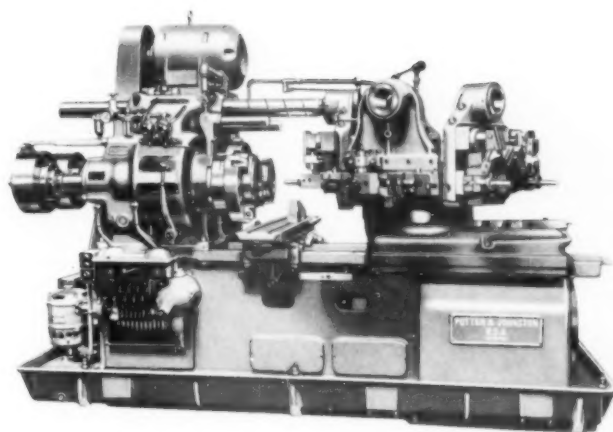
15" - 18"

DESCRIPTIVE LITERATURE AVAILABLE ON ALL MACHINES • THE POTTER

Automatic TURRET LATHES

ure for PROFITABLE PRODUCTION

ine meet YOUR *needs*



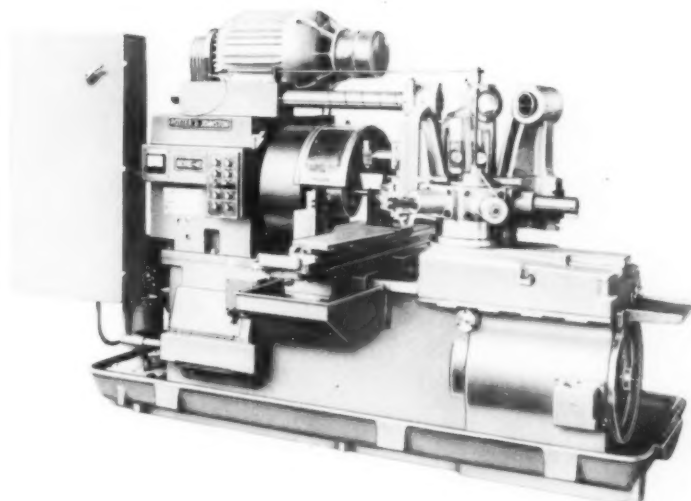
5-D TWO-SPINDLE POWER-FLEX

For added productive capacity with minimum initial cost and floor space. Made in two standard sizes:

5-D2-9"
5-D2-15"

CHUCK SIZES

10" - 12" - 15"

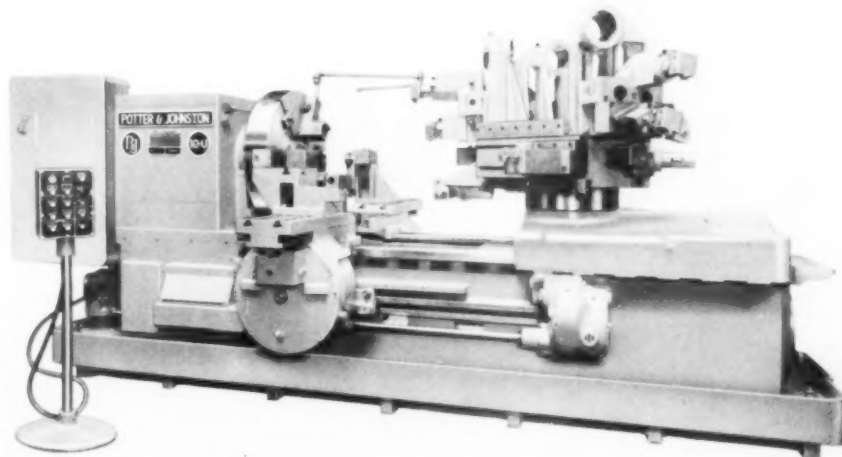


6-D-40 AUTOMATIC

Made in two sizes with different combinations of travels and bed lengths.

CHUCK SIZES

18" - 24" - 30"



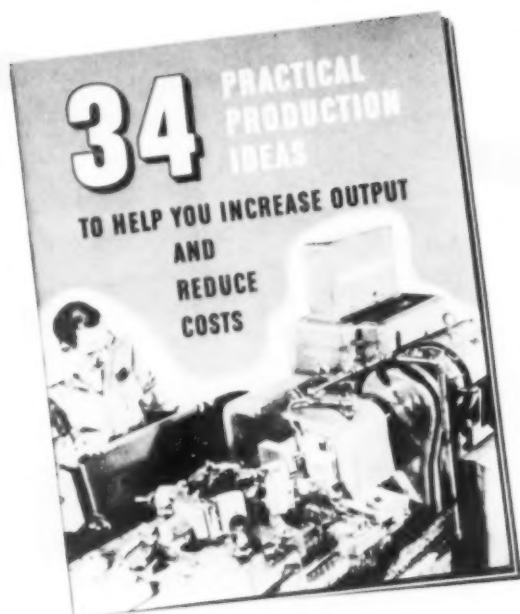
10-U AUTOMATIC

For new speed and economy on your really BIG jobs.

CHUCK SIZES

30" - 36" - 42"

SEND TODAY FOR YOUR FREE COPY ON WAYS and MEANS TO CUT COSTS



24 pages of vital production information that will help you to reduce costs and increase output. 34 job-proven ideas . . . big, clear pictures and drawings . . . informative engineering, machine and material data. Write *today* on your company letterhead.

Individual bulletins also are available on all Potter & Johnston Automatic Turret Lathes illustrated on the preceding pages. Please specify machine sizes in which you are interested.

FACTORY-DIRECT SERVICE AVAILABLE TO YOU FROM A NEARBY BRANCH OFFICE

There is a Pratt & Whitney Branch Office in your territory, as near as your telephone, providing direct, personal contact with Potter & Johnston factory representatives. You will find that these specialists — in addition to having a complete knowledge of our products — are also fully qualified production and tooling engineers. They'll be glad to help you with any of your unusual machining jobs. Plan today to visit or phone the Pratt & Whitney branch nearest you.

POTTER & JOHNSTON Co.

PAWTUCKET, RHODE ISLAND

SUBSIDIARY OF

PRATT & WHITNEY

DIVISION NILES — BEMENT — POND COMPANY

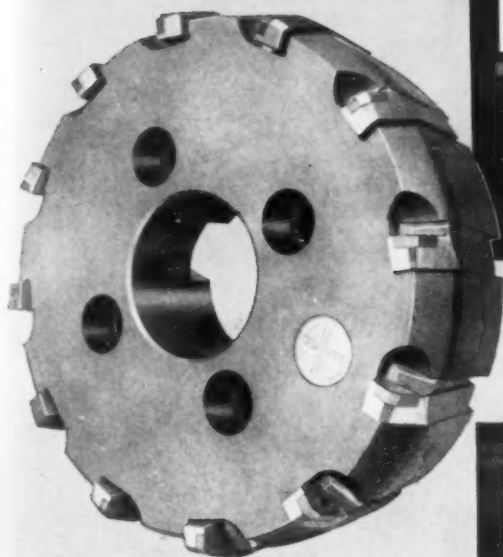


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FOR MORE THAN FIFTY-FIVE YEARS

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See Kroslok in action at
Booth 606, National Machine
Tool Builders' Show, Chicago

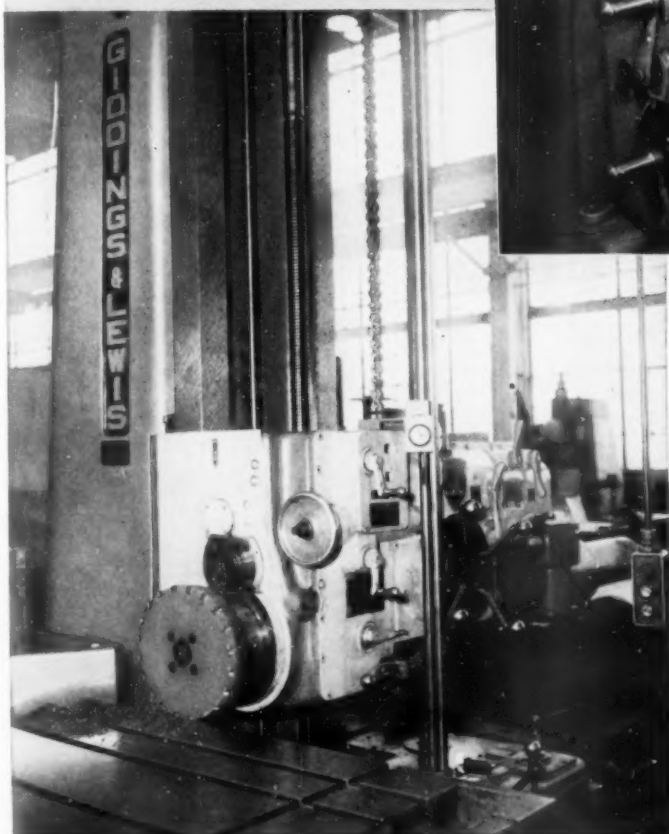
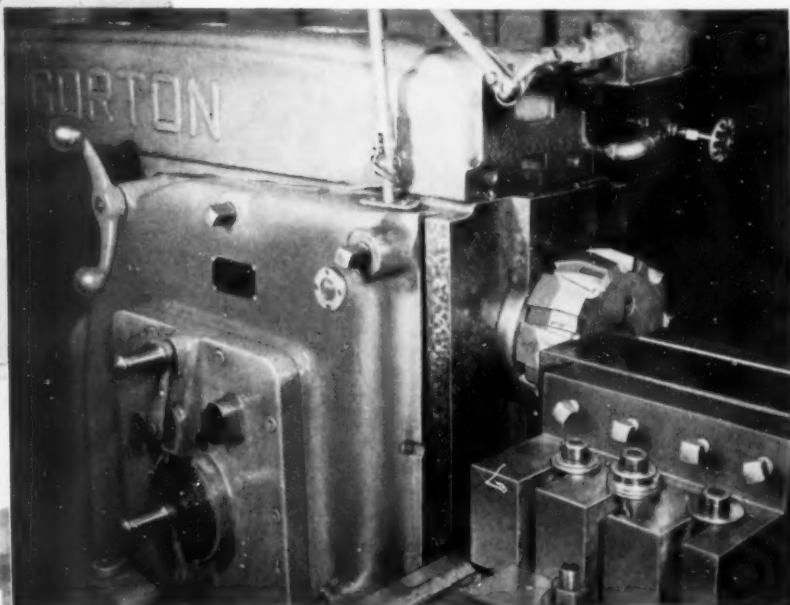
KROSLOK[®] MILLING CUTTERS

GROUP IMPORTANT CONCEPTS
FOR *Higher Production*

TOP FEEDS
AND SPEEDS

**RUGGED
RIGID**

ONLY 3
MEMBERS



Production milling requires
"tops" in production tools.

Production milling realizes a new high with Kroslok face milling cutters and shell end mills. Simplicity of design (only three members), extreme ruggedness and rigidity, merit your thorough investigation. Kroslok is available in general purpose and heavy duty types for ferrous or non-ferrous metals, with both fine tooth and extra fine tooth variations, in diameters from 3" through 24". May we suit Kroslok's advantages to your job?

**THE
MOTCH & MERRYWEATHER
MACHINERY CO.**

CUTTING TOOL MANUFACTURING DIVISION

CLEVELAND 17, OHIO

Stocking Dealers in All Industrial Centers

TRIPLE-CHIP CIRCULAR SEGMENTAL AND SOLID CUT-OFF BLADES • TRIPLE-CHIP
SLITTING SAWS • TRIPLE-C GRINDING COOLANT • TRIPLE-CHIP SOLUBLE OIL

SNYDER SEGMENTED AUTOMATION in 91 station, 182 operation, in-line transfer machine features four segments which can operate independently or as a unit to assure continuous production of auto- motive automatic transmission cases at 100 cases an hour at 80% efficiency

BOOTH 1222

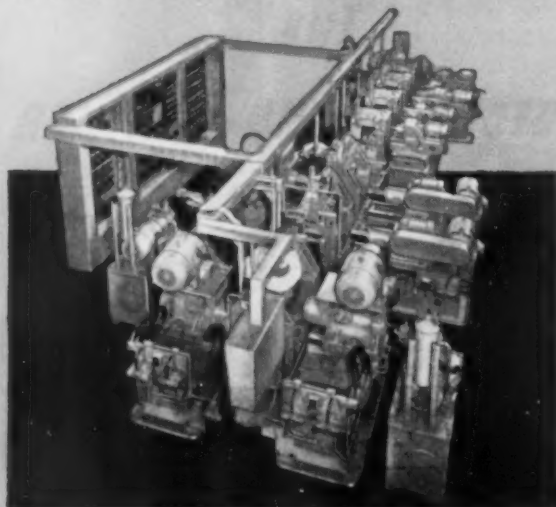


SNYDER

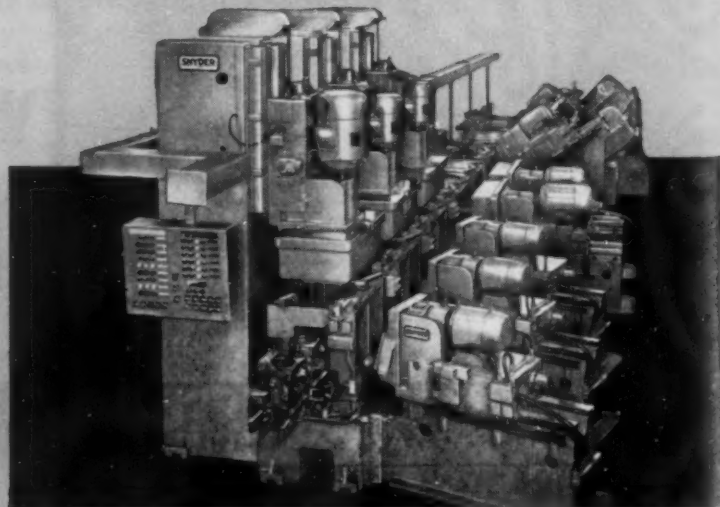
TOOL & ENGINEERING COMPANY
3400 E. LAFAYETTE, DETROIT 7, MICHIGAN

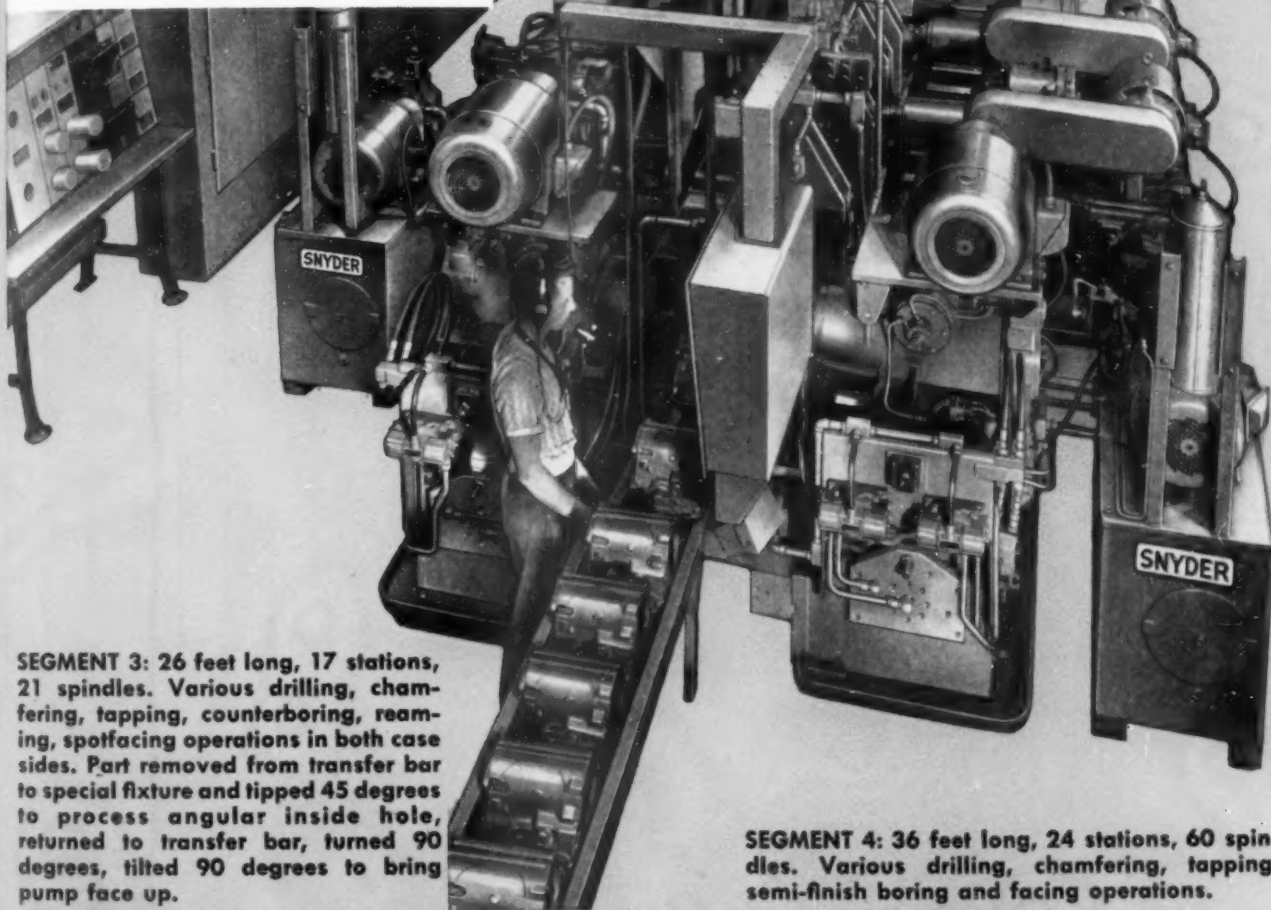
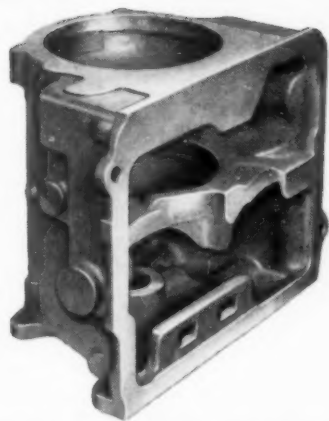
30 Years of Successful Cooperation with Leading American Industries

SEGMENT 1: 40 feet long, 19 stations, 10 spindles. Part manually loaded, both ends face milled, counterbored, three diameters rough and finish bored and faced, two pads side milled, pump pad face milled, clearance slot milled. Part tilted 90 degrees in processing.



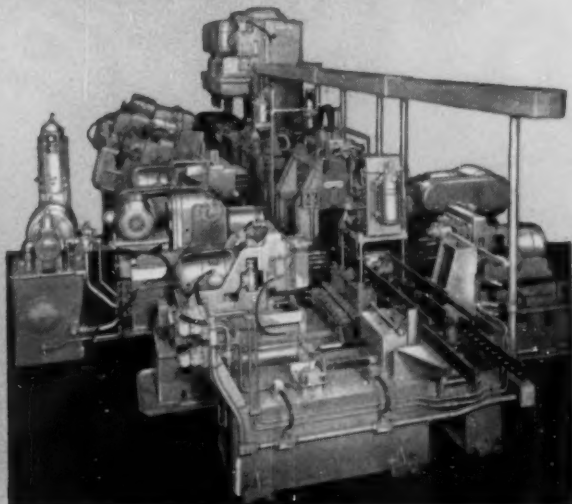
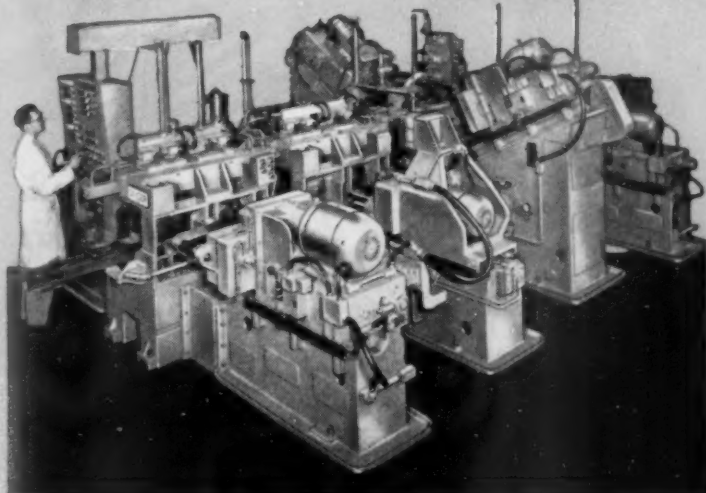
SEGMENT 2: 47 feet long, 31 stations, 91 spindles. In top face, end and at angular locations inside, 51 holes are drilled, countersunk, semi-finish and finish reamed, spot-faced, tapped. Part is tilted 90 degrees and rotated.





SEGMENT 3: 26 feet long, 17 stations, 21 spindles. Various drilling, chamfering, tapping, counterboring, reaming, spotfacing operations in both case sides. Part removed from transfer bar to special fixture and tipped 45 degrees to process angular inside hole, returned to transfer bar, turned 90 degrees, tilted 90 degrees to bring pump face up.

SEGMENT 4: 36 feet long, 24 stations, 60 spindles. Various drilling, chamfering, tapping, semi-finish boring and facing operations.



THE PRECISION



LINE



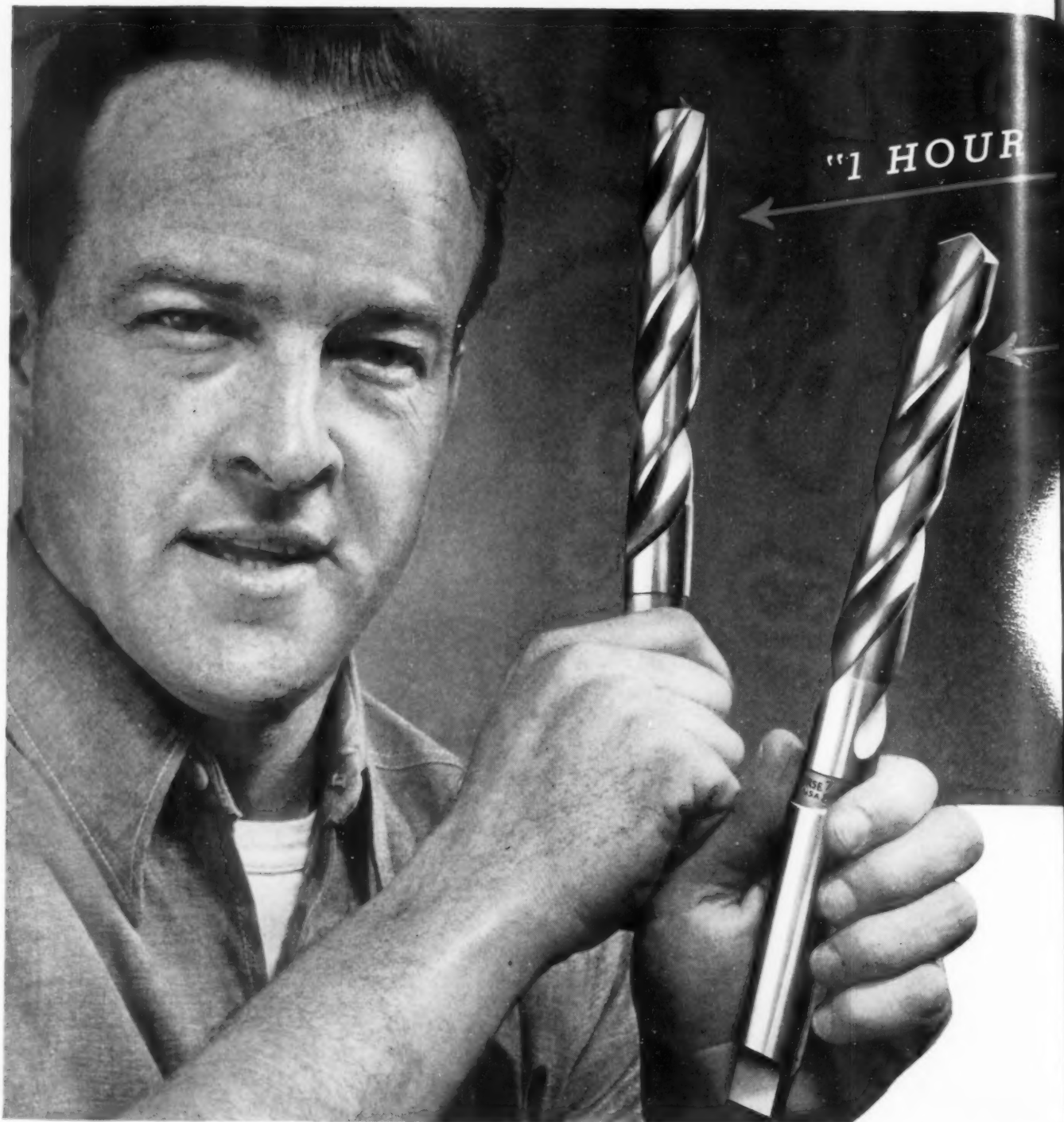
**AT THE SHOW...
BOOTH 1416**

Don't miss seeing the latest developments in The Precision Line of Fellows Gear Production Equipment. If you don't make it to the Show... then it will pay you to contact your nearby Fellows Office for the latest facts.

- **THE FELLOWS GEAR SHAPER COMPANY,**
Head Office and Export Department:
78 River Street, Springfield, Vermont.
Branch Offices: 319 Fisher Building, Detroit 2;
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Fellows

Gear Production Equipment



R
WITH THIS DRILL...

5 HOURS
WITH THIS DRILL!"

...this extra
tool-life is typical of
MORSE
Electrolized Tools!

er
Yes, our files are full of documented testimonials that Morse *Electrolized* Cutting Tools have lasted anywhere from 2 to 10 times longer than untreated tools . . . proof from scores of users that Morse *Electrolizing* lengthens the life and steps up the performance of cutting tools that are subject to excessive wear, abrasion and corrosion.

Briefly, here's what Morse *Electrolizing* does: Relieves internal stresses, raises fatigue limit, increases tool life . . . fortifies tool by a uniform surface of hard, dense alloy . . . provides exceptional anti-galling characteristics . . .

gives greatest corrosion-resistance with fine-grained surface . . . permits no distortion.

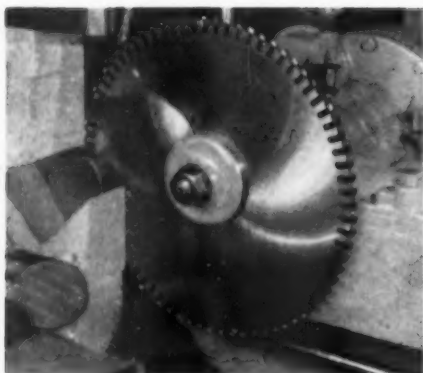
Now, in the application of Morse *Electrolized* Tools to your own particular needs, consult your Morse-Franchised Distributor. He commands the close cooperation of Morse engineers on any tough job you have now . . . or on any job, *tough or not*, where you can profit by the extras you get *only* in Morse *Electrolized* Tools.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
(Division of VAN NORMAN CO.)

Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

MORSE
Cutting Tools

buy them by phone
from your Morse-Franchised
Distributor and save
ordering time

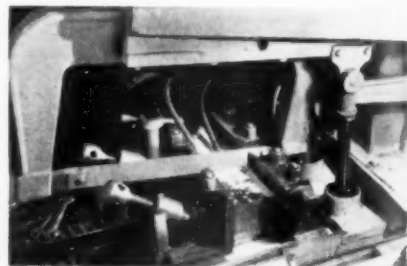


CIRCULAR SAWS. Simonds makes all three types — Inserted Tooth, Segmental, and Solid Tooth Saws. A "right" saw for every metal cutting application.

SPEAKING OF NEW CARS

SIMONDS Helps to Reduce the Cost of cars* like this and yours

Few of us could afford new cars like this without the magic of mass production. One of the things that makes mass production possible is the low cost, dependability of Simonds cutting tools and die steels. Simonds quality has long played an important part in the automotive industry. Carefully maintained by 100% quality control from Simonds own Steel Mill through every step of manufacture in Simonds famous "Windowless" plant, Simonds unique quality keeps production lines moving, unit costs down.



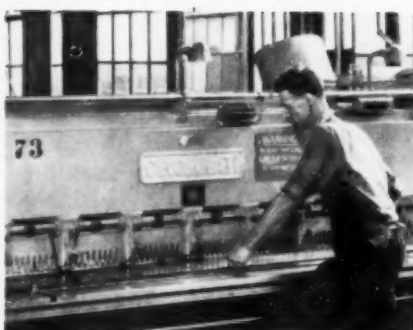
HACK SAW BLADES. Simonds "Red End" Hack Saw Blades (Power and Hand) last uniformly longer, cut metal cutting costs.



BAND SAWS. Simonds makes all three types — Regular Tooth, Sabre or Skip Tooth, Spring Temper — to provide the best blade for every application.



FILES. Mechanics report Simonds "Red Tang" Files feel better, file better, last longer — cut more metal per filing dollar. "Prover-tested" for grade A quality.



SQUARING SHEARS. Simonds single edge shear outlasts other types, costs less for shearing thin sheet metal. Made by Simonds exclusive "Tungsweld" method.



DIE STEEL. Simonds 1001 sizes of flat-ground tool and die steel save more time and money in the toolroom — give excellent results on every job.



For Fast Service
from
Complete Stocks



Call your
SIMONDS
Industrial Supply
DISTRIBUTOR

Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada

CARBOLOY ANNOUNCES 4 MAJOR NEW DEVELOPMENTS

1. Carboloy Machinability Computer

Available now. (See pages 2 and 3 of this 8-page advertisement.)

2. First Easy-To-Use Toolholders

Available now. (See pages 4 and 5 of this 8-page advertisement.)

3. Carbide Surfacing For Machine Parts

In field appraisal. (See page 8 of this 8-page advertisement.)

4. Cemented Oxide Cutting Tools

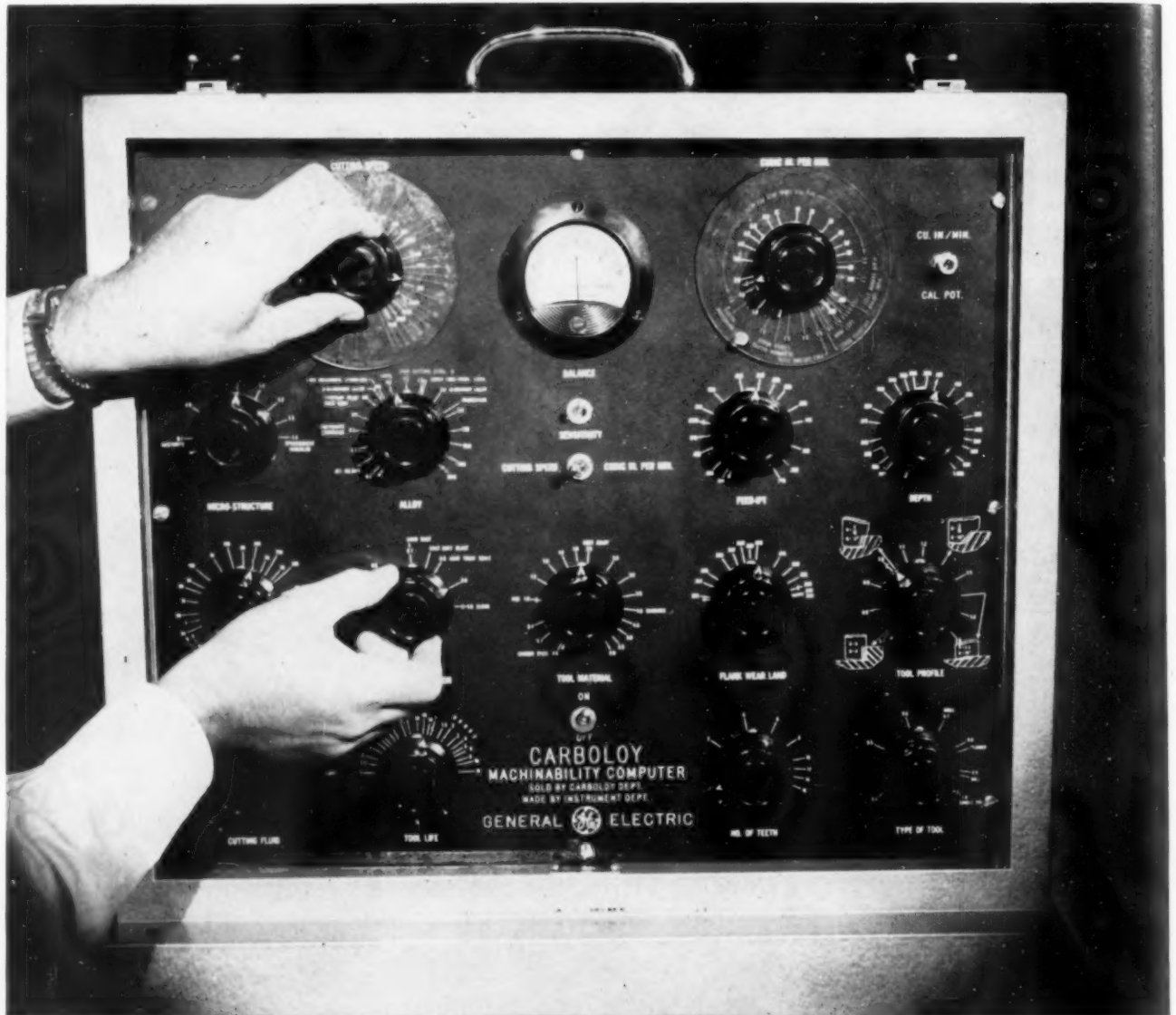
In laboratory appraisal. (See page 8 of this 8-page advertisement.)

**PLUS—INFORMATION ON CUTTING PRODUCTION COSTS WITH
CARBOLOY SERIES 300 STEEL-CUTTING CARBIDES**

**SEE THESE NEW DEVELOPMENTS AT THE
CHICAGO SHOWS—SEPTEMBER 6-16**

National Machine Tool Builders Show
(Booth No. 109)
and
Production Engineering Show
(Booth No. 665)

Carboloy announces the **CARBOLOY MACHINABILITY**



To find an unknown variable like speed, output, or motor horsepower, simply set dials according to known information. Then turn dial of unknown variable until meter (top, center) balances at zero setting. Computer instantly shows what happens when any of the variables listed below are changed.

Computes values for any of these 19 operating variables:

Material Cut:

Work material
Microstructure
Hardness
Surface condition

Cutting Tool:

Tool material
Tool life
Flank wear land
Tool profile
Type of tool
Number of teeth

Cutting Conditions:

Cutting fluids	Motor horsepower
Feed	Cubic inches per minute
Depth of cut	Unit horsepower
Cutting speed	Work diameter
	R.P.M.

COMPUTER

- New engineering tool solves complex machine setup problems in seconds, instead of hours
- Shows how to vary cutting conditions to increase machine, cutting tool, and operator efficiency

In seconds, the low-cost Carboloy® Machinability Computer calculates the effect of 19 basic machining variables on machine performance, tool life, and output.

In seconds, it shows optimum operating conditions for any metal-cutting job, eliminating wasteful experimental runs.

In seconds, it shows how to improve existing setups by the right variation of operating conditions.

Easy to use

The Carboloy Machinability Computer is easy to operate. Anyone with machining experience can use it after a short familiarization period.

Results are numerical — requiring no further interpretation from the direct-reading dials. Accuracy is assured — based on more than a year's testing on in-plant applications at key General Electric plants.

Handles many jobs

The Carboloy Machinability Computer handles basic information on operating conditions, type

and condition of work material, style and material of tools. The computer accurately predicts cubic inches per minute removed, tool life, and required machine horsepower. It shows how changing speed, feed, depth of cut, or tool material will affect these and other variables.

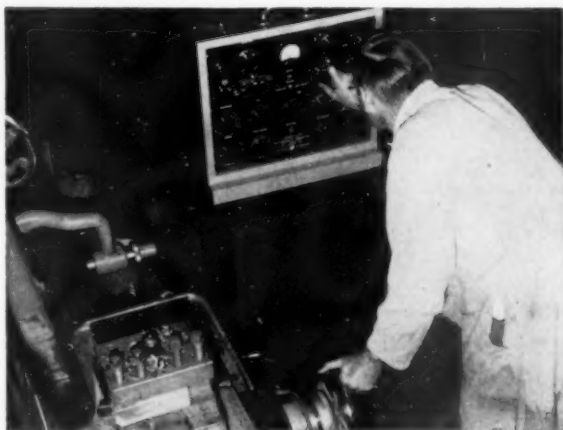
The Computer solves — in seconds — problems that would be otherwise impractical because of the large number of machining variables involved.

The Carboloy Machinability Computer was developed and proved in the field by a team of Carboloy and General Electric engineers, under the direction of Dr. W. W. Gilbert, of G.E.'s Manufacturing Services Division.

The Computer is portable (weighs only 32 lbs.), battery-operated, and measures 21" x 7" x 20".

The price of the Carboloy **\$495.** Machinability Computer is ... (f.o.b. factory, Detroit)

Whether your plant is large or small, the Computer can bring you immediate benefits. Send the coupon on page 8 of this advertisement for complete information.



See the Carboloy Machinability Computer at the Carboloy Exhibits of Metalworking Progress

National Machine Tool Builders Show
and

Production Engineering Show
Chicago — September 6-16

◀ TYPICAL IN-PLANT COMPUTER APPLICATION

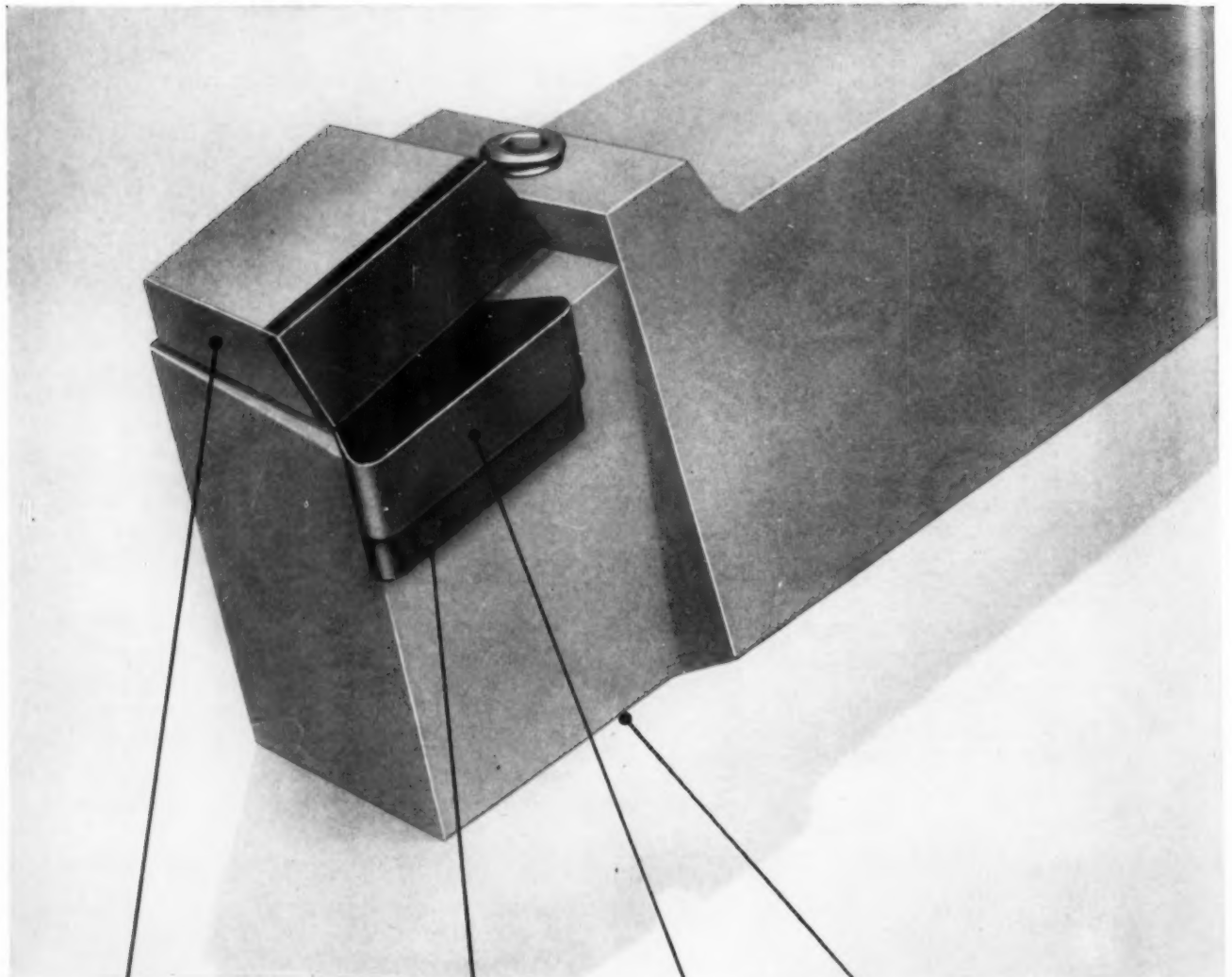
PROBLEM: Setting up 16", 10-HP lathe to turn hot-rolled 1020 steel bar with 10" diameter, to get tool life of 1 hour.

SOLUTION: Starting from scratch on a new setup, days could be used by experienced tool men to find a satisfactory set of operating conditions ... with no assurance that the result would be the best possible. With the computer, the optimum setup was established, and the effect of changing key variables compared, in less than 15 minutes.

BENEFITS: Computer turned lengthy setup time into valuable production time. On this job alone, the savings gained through days of extra production, plus savings in manpower costs, would more than equal the value of the computer.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

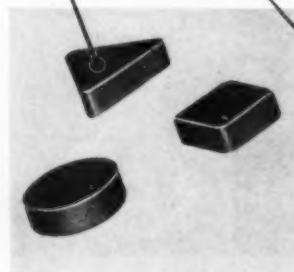
Carboloy announces THE FIRST SIMPLE-TO-USE



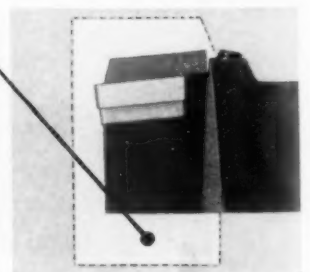
Clamp has built-in, wear-resistant carbide chip-breaker. Requires only light finger pressure to tighten; assures uniform chips, regardless of cut.



Indexable carbide pad is screwed to shank. Stays put while blank is indexed. Absorbs shock; decreases the possibility of holder damage.



Holders available for round, square, or triangular inserts. Expanded line of precision and utility blanks handle any machining job.



Unique design eliminates "club" below shank; reduces overhang to absolute minimum. Indexing is fastest, simplest ever, cuts changing time.

TOOLHOLDERS

- Single adjustment screw indexes throwaway insert, sets chipbreaker . . . right in the machine
- Entirely new design reduces overhang, prevents chip interference, provides greater rigidity
- Carbide pad protects shank by absorbing shocks
- Heat-treated shank resists bending, deformation

Unique clamping arrangement means you can index the blank, or turn it over — right in the machine — by simply adjusting a single screw at the top of the shank. The carbide chipbreaker is automatically set in the correct position.

Carbide pad cuts insert costs

The carbide pad allows more effective use of thin — and more economical — blanks. It gives greater rigidity; lets you use a harder grade of carbide, at greater speeds and feeds, to increase machine output at no extra cost.

Unique Carboloy holder design has no projection below the shank, keeping overhang at a minimum and providing greater rigidity and accuracy. Minimum projection

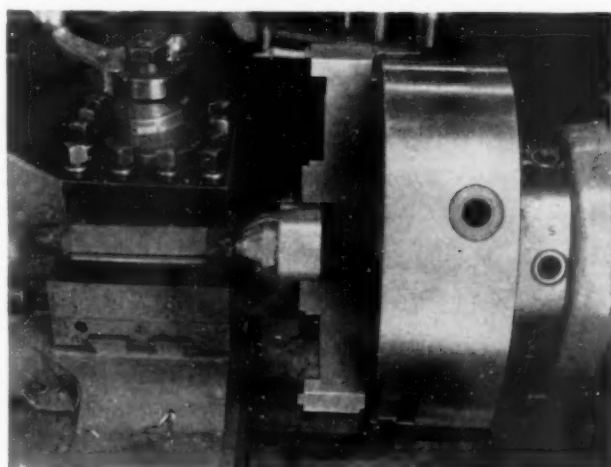
above the shank prevents chip interference and minimizes danger to clamp from flying chips.

Heat-treated shank gives the holder extra strength to resist deformation from clamp screw, and wear from chips.

Versatile holder design

The holder is quickly adaptable to "specials" with cutting angles other than standard, to positive or neutral rakes. Also, it is especially adaptable for gang tooling.

The new holder is stocked in seven styles and 52 sizes — paralleling the styles and sizes of Carboloy braze-type tools. For complete details on these easy-to-use toolholders, send coupon on page 8 of this advertisement, today.



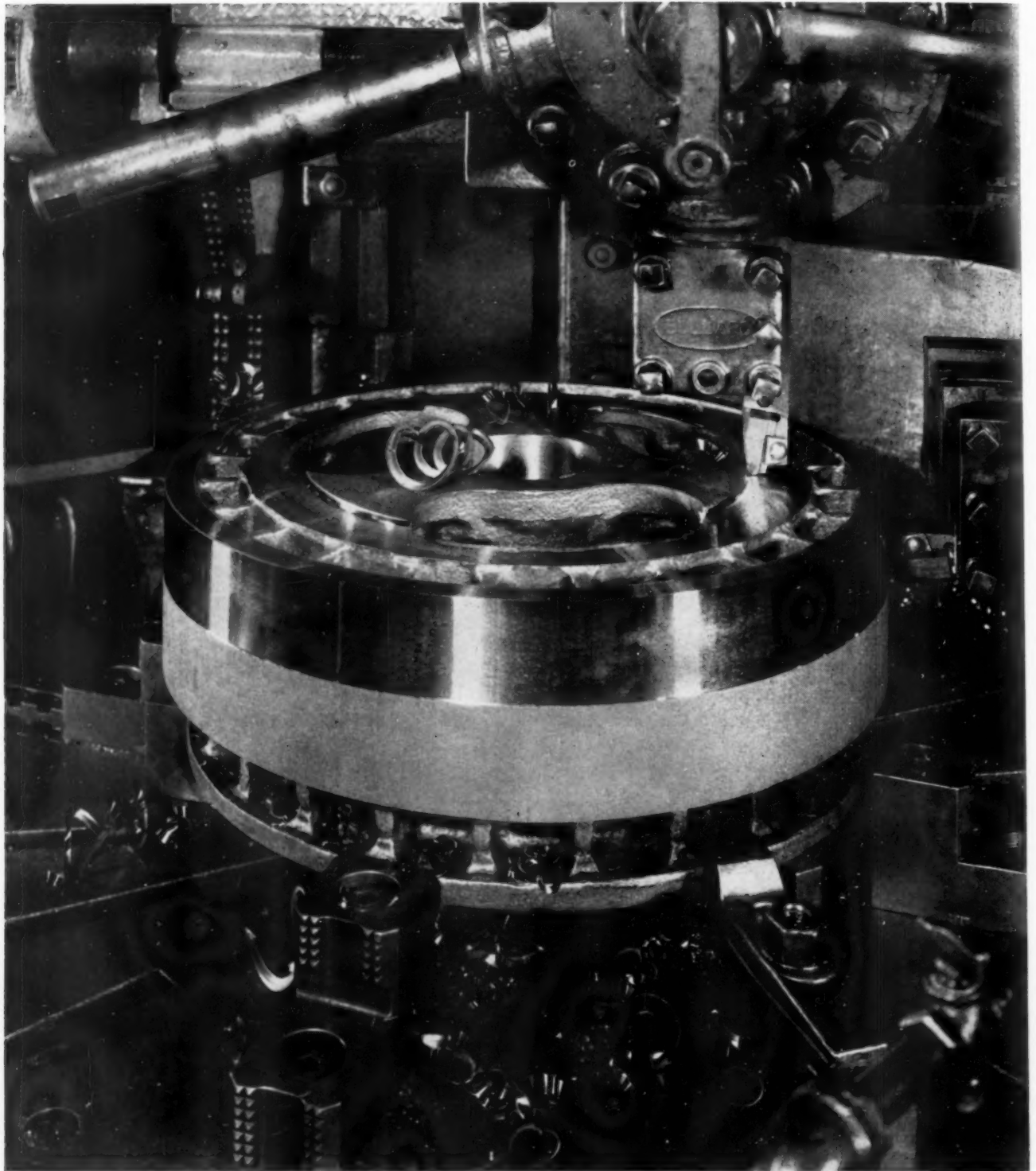
CONTOURING STELLITE VALVE. Round Carboloy insert is furnished precision-ground, eliminating costly grinding operation required for braze-type tools. Inserts on new Carboloy toolholder are indexed or turned over, right in the machine, reducing downtime. With Carboloy holders, only inserts are stocked, saving valuable toolroom space.

See Carboloy Carbide-Pad Toolholders
at the
Carboloy Exhibits of Metalworking Progress

National Machine Tool Builders Show
and
Production Engineering Show
Chicago — September 6-16

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

GRADES 350,370 INCREASE



FACING POWER-SHOVEL CLUTCH AND BRAKE DRUM. It took as many as 16 of the former carbide tools, on a 42-inch Bullard, to make a *single* cut through multiple sand inclusions and heavy interruptions. But a switch to Carboloy Grade 370 cut over-all machining costs almost 70%. A Grade 370 tool took *nine* cuts without any appreciable wear, reducing downtime costs from \$60 to \$1, and grinding costs from \$30 to nothing. Result: Greatly increased output from this machine. **SETUP:** Material — 1045 low carbon, high manganese cast steel, with hardness of 27R_c. **Speed** — 24 RPM. **Feed** — 0.018-0.033 inch. **Depth of cut** — $\frac{3}{8}$ inch. **Coolant** — No.

MACHINE TOOL OUTPUT

- Series 300 carbides continue to set performance records
- New Carboloy toolholders and expanded insert line increase opportunities for more new applications

In plant after plant, the combination of the proper machine tool and performance-proved Carboloy Grades 350 and 370 is setting production records. The case history on the opposite page is just one of hundreds which have been recorded.

Range of use extended

Versatile Grades 350 and 370 cover steel-cutting from medium finishing to heavy-

duty roughing. Now, with the expanded line of Carboloy inserts and new toolholders, these grades can be applied to *any* application. In-plant production records have been set on turning, boring, milling, facing, planing, and other machining jobs.

Contact your local Authorized Carboloy Distributor for off-the-shelf tools and blanks, or send coupon on next page for price list and catalog.

MANY NEW MACHINES AT THE NMTBA SHOW WILL BE RUNNING WITH CARBOLOY CEMENTED CARBIDES

Builders of these machines include:

COMPANY	BOOTH NO.	COMPANY	BOOTH NO.
American Steel Foundries		The G. A. Gray Co.	1120
King Machine Tool Division	1121	Jones & Lamson Machine Co.	1111
Axelson Manufacturing Company		Kearney & Trecker Corporation	508
Division of U.S. Industries, Inc.	519	The Lapointe Machine Tool Company	707
Barber-Colman Company		The R. K. LeBlond Machine Tool Company	1313
Hendey Machine Division	221	Lipe-Rollway Corporation	803
Brown & Sharpe Mfg. Company	520	The Lodge & Shipley Company	502
Bryant Chucking Grinder Co.	1015	The Monarch Machine Tool Company	920
The Bullard Company	1213	The National Acme Company	324 & 705
Cincinnati Lathe & Tool Co.	309	The New Britain Machine Company	1419
The Cleveland Automatic Machine Co.	412	The Ohio Machine Tool Co.	301
The Cleveland Grinding Machine Co.	810	Pratt & Whitney	
Cone Automatic Machine Company, Inc.	401	Division Niles-Bement-Pond Company	1219
The Cross Company	1118	Rockford Machine Tool Company	1423
DeVlieg Machine Co.	1317	The Sheffield Corporation	1305
Ex-Cell-O Corporation	1319	The Sidney Machine Tool Company	1116
Geometric Tool Company Division		The Springfield Machine Tool Co.	612
Greenfield Tap and Die Corporation	223	Sundstrand Machine Tool Co.	1412
Giddings & Lewis Machine Tool Co.	710	Van Norman Company	905
Gisholt Machine Company	1413	The Warner & Swasey Co.	717

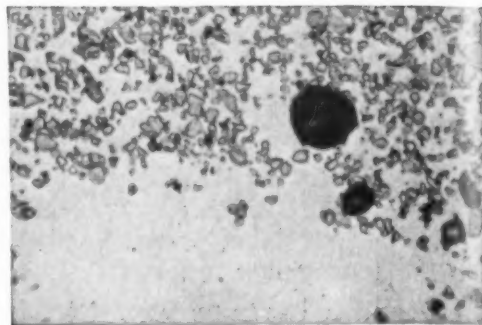
See Carboloy Cemented Carbides in Action

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

Carboloy announces **CARBIDE SURFACING**

Now in field appraisal, coatings of tungsten carbide bonded to vital surfaces of machine and product parts to combat wear. These surfaces have wear-resistant properties similar to solid cemented carbides. Where it is impractical to use a solid carbide blank, this process can be applied. (Not commercially available.)

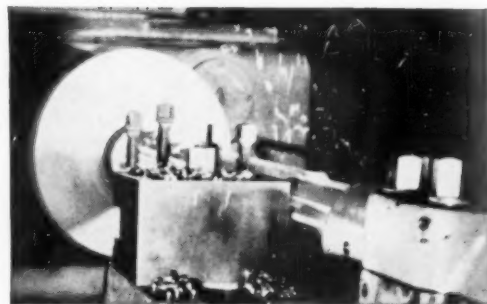
Photomicrograph of surfaced cross-section, showing metal-lurgical bond and distribution of carbide particles (500X).



CEMENTED OXIDE TOOLS

Now in laboratory appraisal, cemented oxide cutting tools for precision finishing of steel at speeds up to 2500 FPM. Extremely hard, the new oxide tools are made entirely of non-strategic materials. They will be operating on several jobs at the NMBTA Show. (Not commercially available.)

Cemented oxide tool cutting at 2000 FPM on 125-HP lathe at Carboloy's Machinability Lab. (Feed: 0.005 inch. Depth of cut: 0.100 inch.)



See these new developments at the Carboloy Exhibits of Metalworking Progress
National Machine Tool Builders Show and Production Engineering Show
Chicago — September 6-16

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

CARBOLLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY
11101 E. 8 Mile Blvd., Detroit 32, Michigan

Send me information on the following
Carboloy products:

- ☐ Carboloy Machinability Computer
- ☐ First Easy-To-Use Toolholders
- ☐ Expanded line of insert blanks
- ☐ Grades 350 and 370 steel-cutting carbides
- ☐ Put me on the list to get data on carbide surfacing, when available

Name _____

Position _____

Company _____

Address _____

City _____ Zone _____ State _____

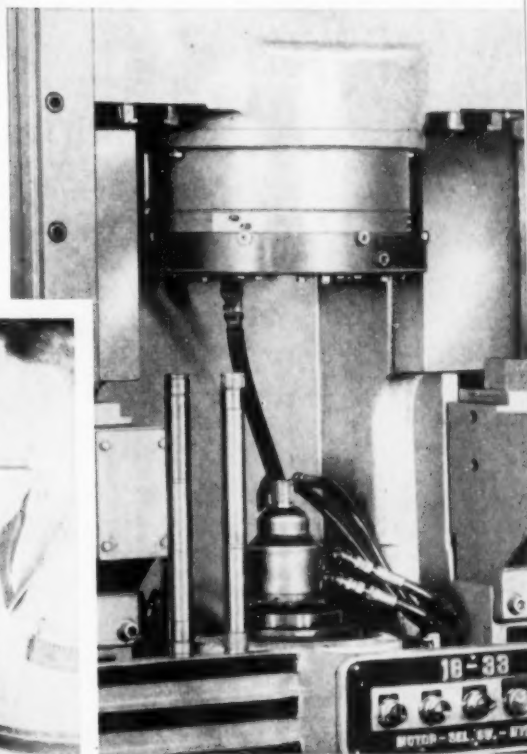
CARBOLLOY CREATED METALS FOR INDUSTRIAL PROGRESS

This Month's **GEAR PIX**



AUTOMATED SPEEDER... facilitates speeding of production gears in mesh with an accurate master or a master mating gear. Inspector places gears to be speeded in the chute, and flicks a lever to divert any rejects that exceed sound level requirements. Cycle time on helical gear shown is 6 seconds.

12 & 15 SECONDS, respectively, is the cutting cycle time for the $\frac{7}{8}$ " and $1\frac{1}{4}$ " width splines on an 18-33 Shear-Speed gear shaper. The 28-tooth, 24-pitch splines are formed on a relatively thin-walled hollow shaft adjacent to bearing surfaces.



SPLINES ON AXLE SHAFTS cold formed automatically on the Roto-Flo spline roller. This will be on exhibit at the Machine Tool Show.



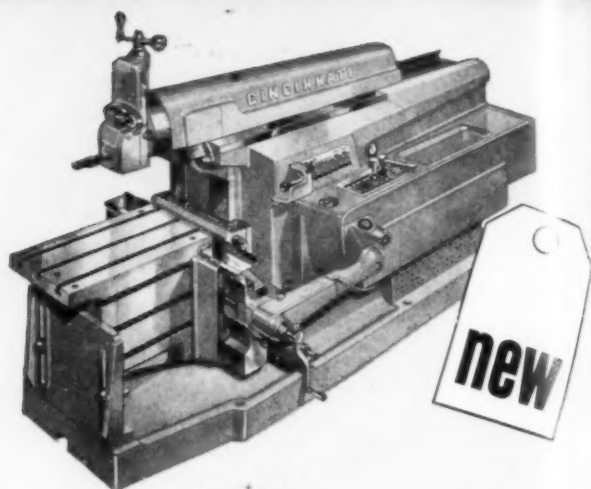
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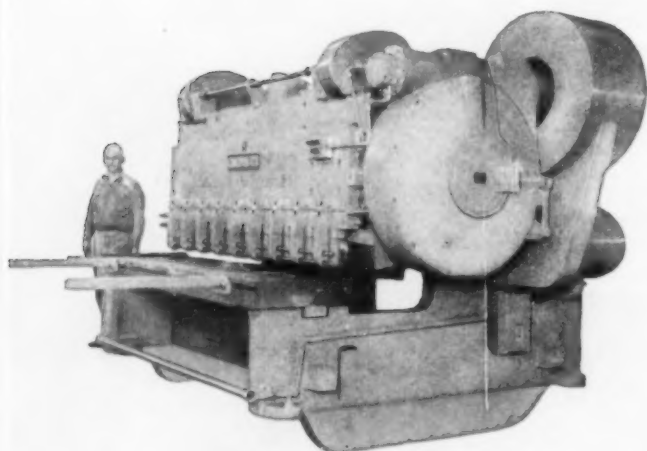




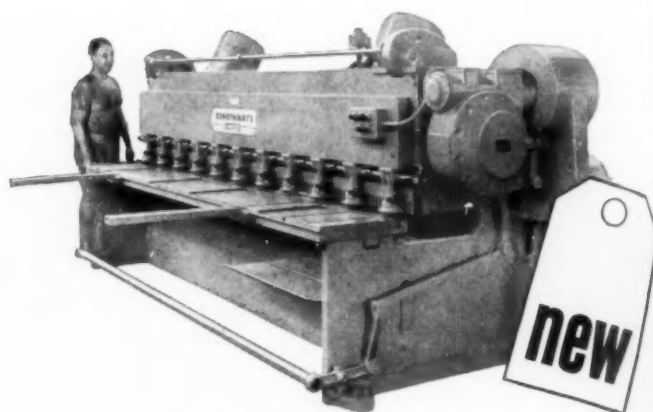
42" CINCINNATI ALL STEEL SHAPER,
16 cutting speeds, 25 to 400 FPM.



**16" HEAVY DUTY CINCINNATI RIGID
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10008 CINCINNATI ALL STEEL SHEAR,
capacity 1" x 8' mild steel.



1410 CINCINNATI ALL STEEL SHEAR,
capacity 3/16" x 10' mild steel.



**2-30 x 5' CINCINNATI ALL STEEL PRESS
BRAKE,** capacity 30 ton or 14 gauge x 6'
mild steel.



**3-50 x 6' CINCINNATI ALL STEEL PRESS
BRAKE,** capacity 50 ton or 10 gauge x 6'
mild steel.

See Cincinnati

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at THE MACHINE TOOL SHOW

INTERNATIONAL AMPHITHEATRE-CHICAGO, ILL.

SEPTEMBER 6-17

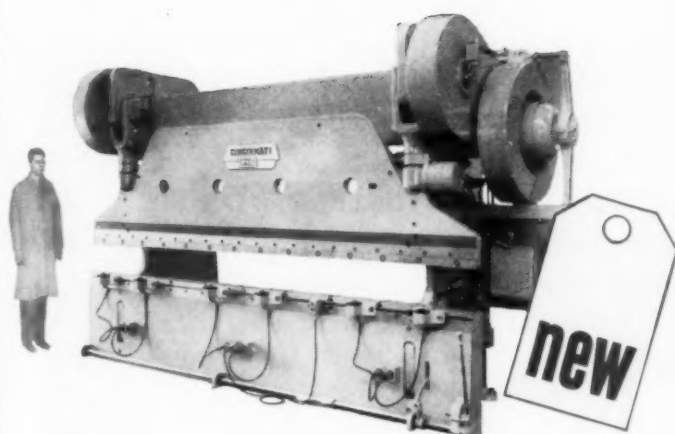
BOOTH 1105



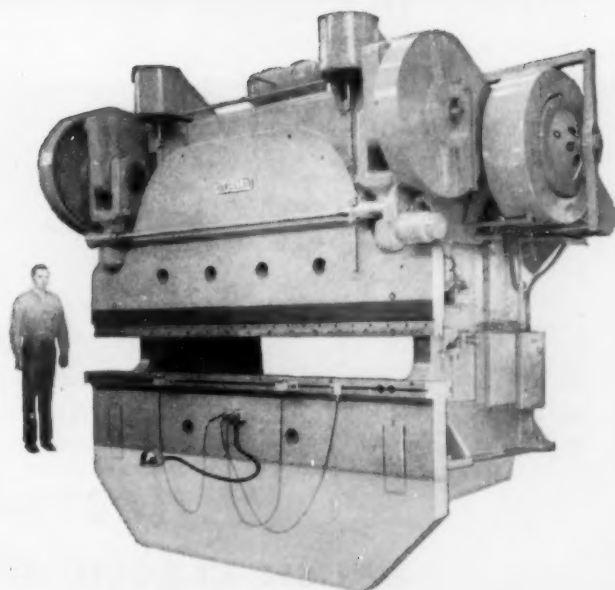
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**CHICAGO, ILL.
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No. 3C Die Sinker
Velvetrace Milling Machine
BL 3622 Model C Keller Machine
BG-21 Keller Machine
48" Vertical Rotary Table
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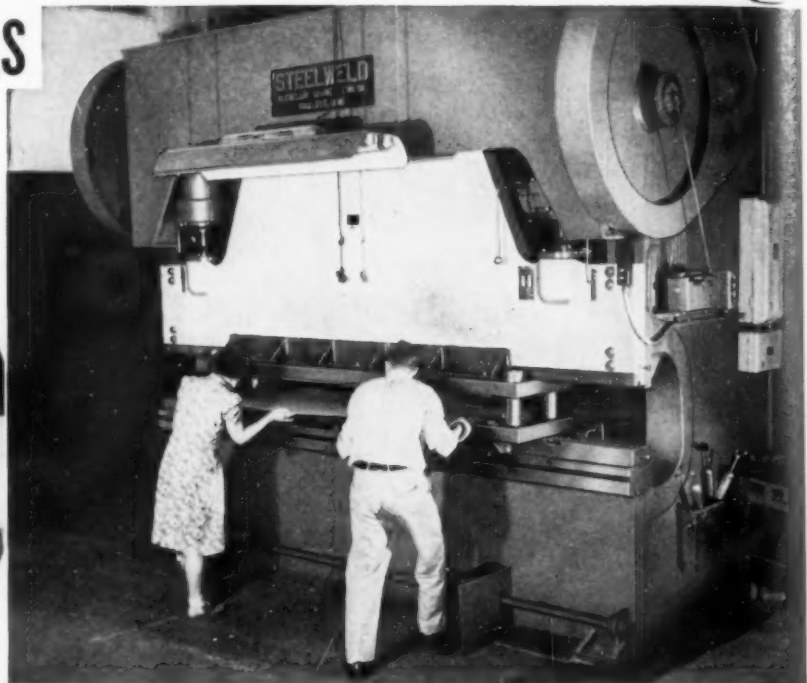


MACHINE TOOLS • CUTTING TOOLS • GAGES
1860

blanking and embossing ACOUSTIMETAL PANELS



4800 panels for 12" x 24" sound-deadening cells are blanked out and embossed per 8-hour day with these dies.



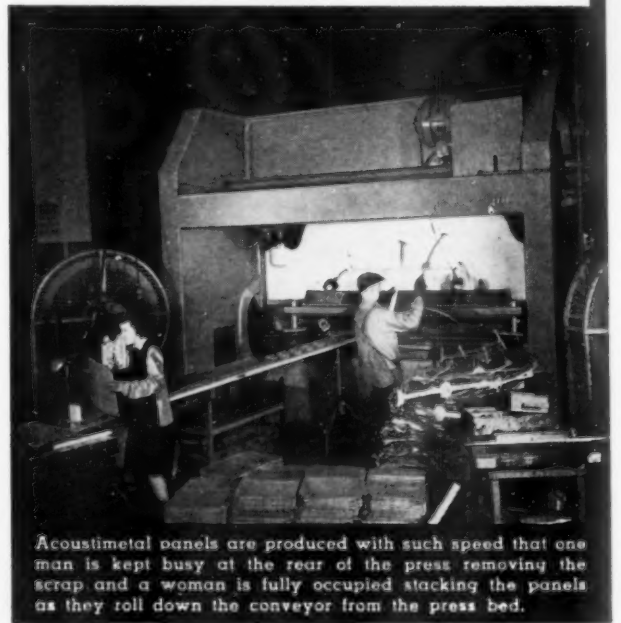
This rugged smooth-working press performs nearly every kind of metal forming operation at Dussing & Hunt, Inc.—bending, forming, flanging, blanking, embossing, and punching. It is easy to change the dies from one job to another or repeat previous runs of work to close tolerances.

Of the many types of work performed on the Model J4½-10 Steelweld Press at Dussing & Hunt, Inc., Buffalo, N. Y., the blanking and embossing of panels for Acoustimetal sound-deadening cells is one of the most interesting.

Large sheets of 26 gauge perforated metal are fed into the dies attached to the bed and ram, by the man operator and his woman assistant. At each stroke of the ram three panels are blanked out and embossed. Six panels for 12" x 24" cells are made from each sheet. 100 sheets are passed through the press per hour. Thus, 600 panels are turned out per hour, or 4800 per eight-hour day.

A large variety of metal parts are produced on the Steelweld. Included are 22-gauge stainless steel tops for deep-freeze cabinets with neatly rounded flanges, fire-proof doors and all-steel industrial doors of 10 to 14 gauge, 14-gauge pressed steel frames, heavy steel channels and many other parts.

The press was installed in 1942 and has been kept going continuously. The Plant Manager of this rapid-growing concern says, "It has proved very satisfactory and efficient."



Acoustimetal panels are produced with such speed that one man is kept busy at the rear of the press removing the scrap and a woman is fully occupied stacking the panels as they roll down the conveyor from the press bed.



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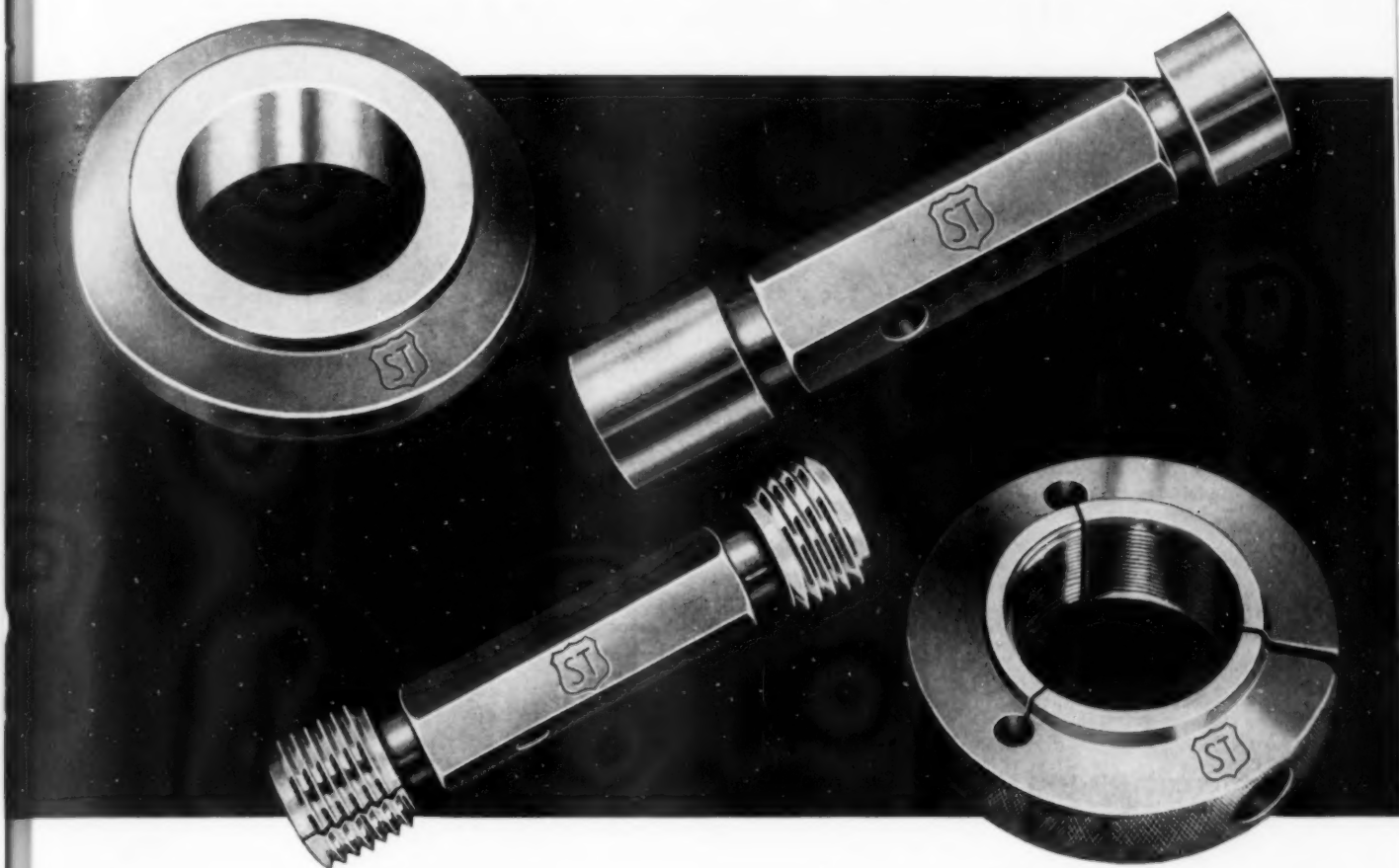
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Series Y3400-LC.



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32 bearing inch capacity.

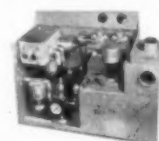


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Model 30-41-2S— $\frac{1}{4}$ " pipe size.
32 bearing inch capacity.

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Reversible.
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5 pipe sizes, $\frac{1}{4}$ " to 1" inclusive.
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Reversible.
Series SO-41 and SO-42.



1 QT. OIL CAPACITY
5 pipe sizes, $\frac{1}{4}$ " to 1" inclusive.
Replaceable, metal oil reservoir.
Reversible.
Series S406.



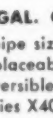
$1\frac{1}{4}$ " and $1\frac{1}{2}$ " pipe sizes.
Permanent, metal oil reservoir.
Series 406.



2 QT. OIL CAPACITY
5 pipe sizes, $\frac{1}{2}$ " to $1\frac{1}{2}$ " inclusive.
Permanent, metal oil reservoir.
Series 408.



2 GAL. OIL CAPACITY
5 pipe sizes, $\frac{1}{4}$ " to 1" inclusive.
Replaceable, metal oil reservoir.
Reversible.
Series X400 and X402.



$1\frac{1}{4}$ " and $1\frac{1}{2}$ " pipe sizes.
Replaceable, metal oil reservoir.
Series X406.

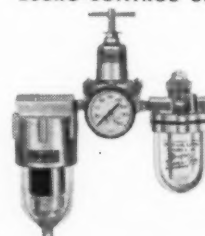


5 GAL. OIL CAPACITY
5 pipe sizes, $\frac{1}{4}$ " to 1" inclusive.
Replaceable, metal oil reservoir.
Reversible.
Series Y400 and Y402.

$1\frac{1}{4}$ " and $1\frac{1}{2}$ " pipe sizes.
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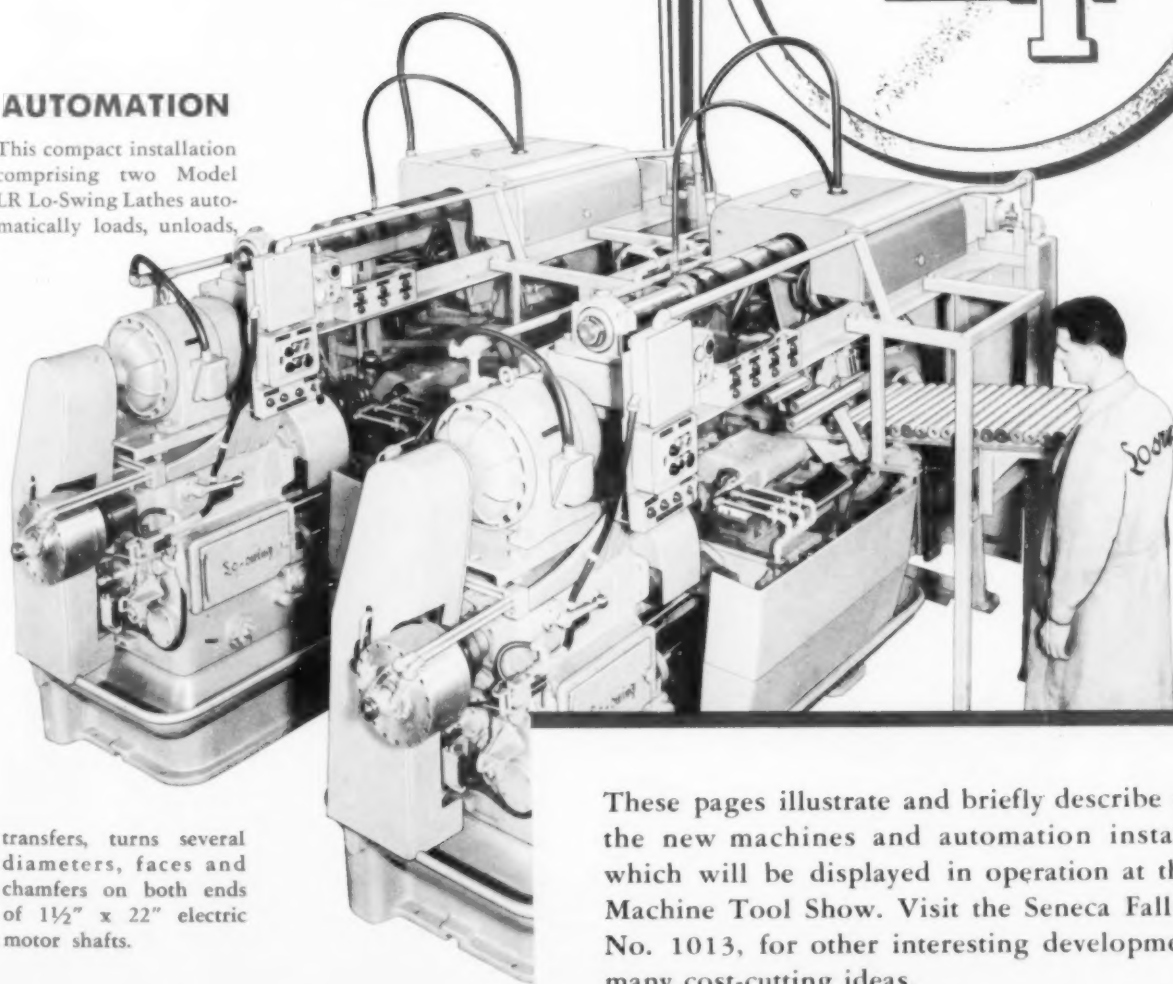
Lo-swing

MACHINES AT THE SHOW



AUTOMATION

This compact installation comprising two Model LR Lo-Swing Lathes automatically loads, unloads,

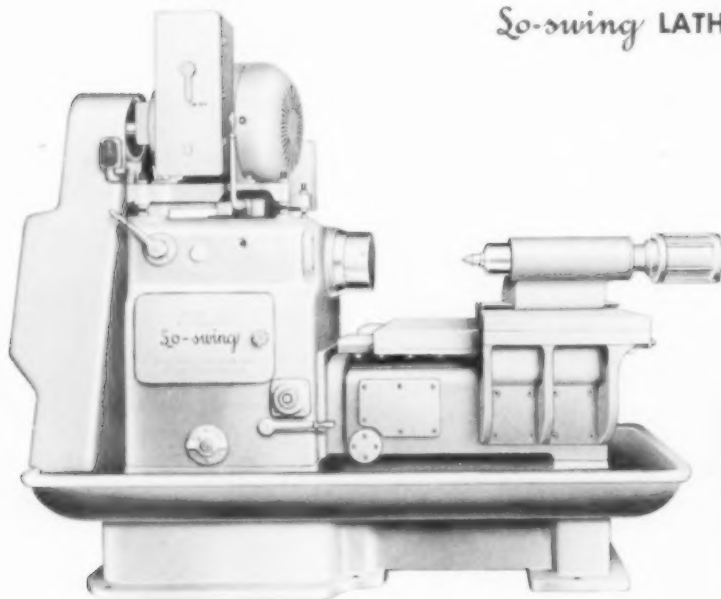


transfers, turns several diameters, faces and chamfers on both ends of 1½" x 22" electric motor shafts.

These pages illustrate and briefly describe some of the new machines and automation installations which will be displayed in operation at the 1955 Machine Tool Show. Visit the Seneca Falls booth, No. 1013, for other interesting developments and many cost-cutting ideas.

MODEL LN PLATEN TYPE AUTOMATIC

So-swing LATHE



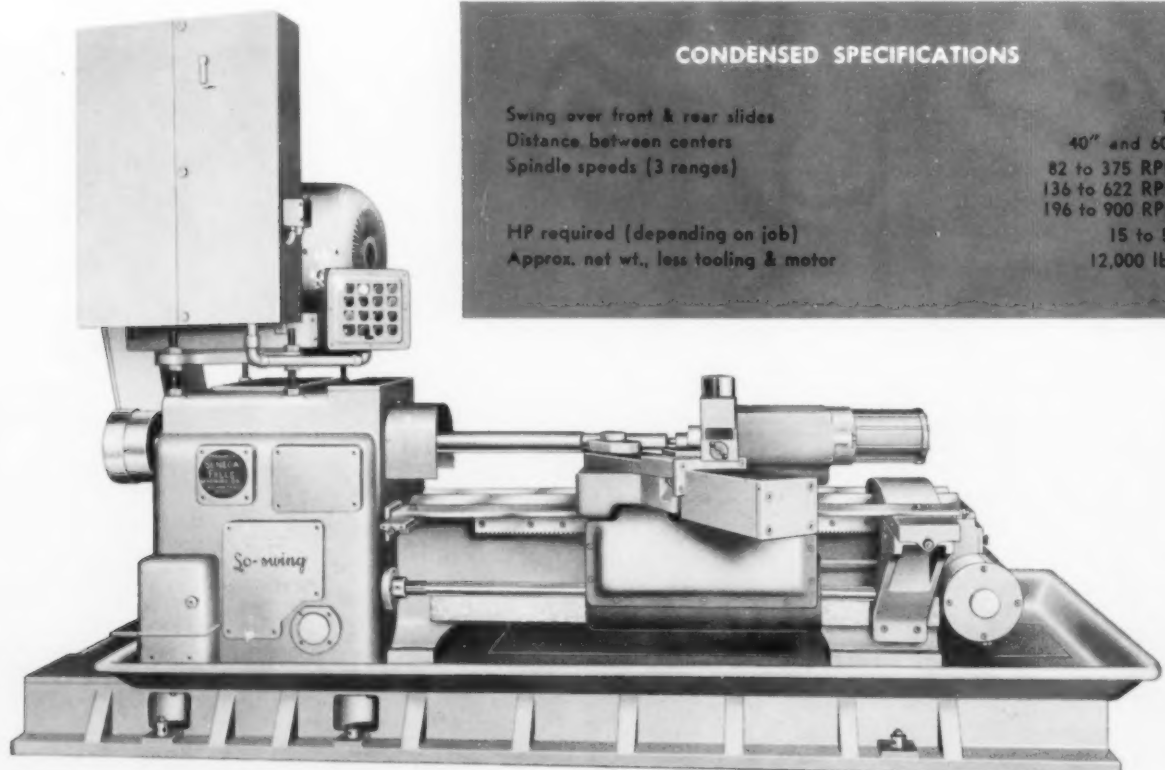
A fully-automatic, cam-operated lathe designed principally as a chucking machine adaptable to a wide variety of work requiring large swing capacity, high spindle speeds, multiple tooling, and fast cycle operation. Its design, however, permits mounting an air-operated tailstock on a bridge which joins the front and rear sections of the bed, without obstructing movement of the platen. The tailstock provides additional support for long parts extending some distance from the chuck.

CONDENSED SPECIFICATIONS

Swing, over bed ways over platen	24 1/2"
	18 1/2"
Maximum dia. of chuck, over platen	18"
Spindle speeds (3 ranges)	60 to 406 RPM
	146 to 980 RPM
	308 to 2080 RPM
Feed per revolution of spindle	.003" to .024"
HP required (depending on job)	7 1/2 to 20
Approx. net wt., less tooling & motor	5,200 lbs.

A modern, fully-automatic, high speed machine which can be easily set up and operated by semi-skilled labor. Recommended for machining shafts in small or medium lots, using a simple type of master template to reproduce size and profile. Operator pushes starting button and tracer-controlled tool rough turns, then finish turns, carriage

returns to starting position and spindle stops. Longitudinal feed is by rack and pinion, providing unlimited carriage travel. Fully-automatic Back Squaring Attachments, with synchronized feed cycle, are available for facing and undercutting operations.

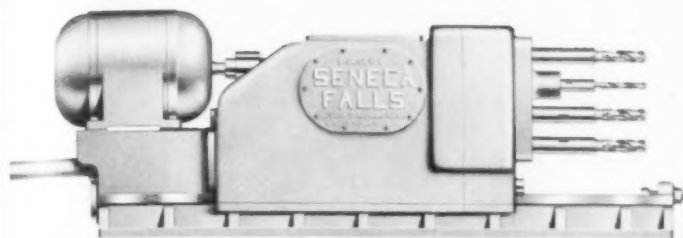


CONDENSED SPECIFICATIONS

Swing over front & rear slides	7"
Distance between centers	40" and 60"
Spindle speeds (3 ranges)	82 to 375 RPM
	136 to 622 RPM
	196 to 900 RPM
HP required (depending on job)	15 to 50
Approx. net wt., less tooling & motor	12,000 lbs.

MODEL AP TRACER TYPE So-swing LATHE

MODEL WD WAYDRILL PRODUCTION UNIT



CONDENSED SPECIFICATIONS

Standard speed range, with 1150 RPM motor	130 to 1150 RPM
with 1750 RPM motor	200 to 1750 RPM
Standard drilling feed	.004" to .017"
Special drilling feed	.001" to .050"
Rapid traverse, inches per min.	300
Maximum thrust	11,000 lbs.
Maximum feed stroke, width & height	16"
Drilling area of head	20" x 19"
Maximum frame size of motor	NEMA 326
Overall dimensions	20" x 74" x 33 1/4" high

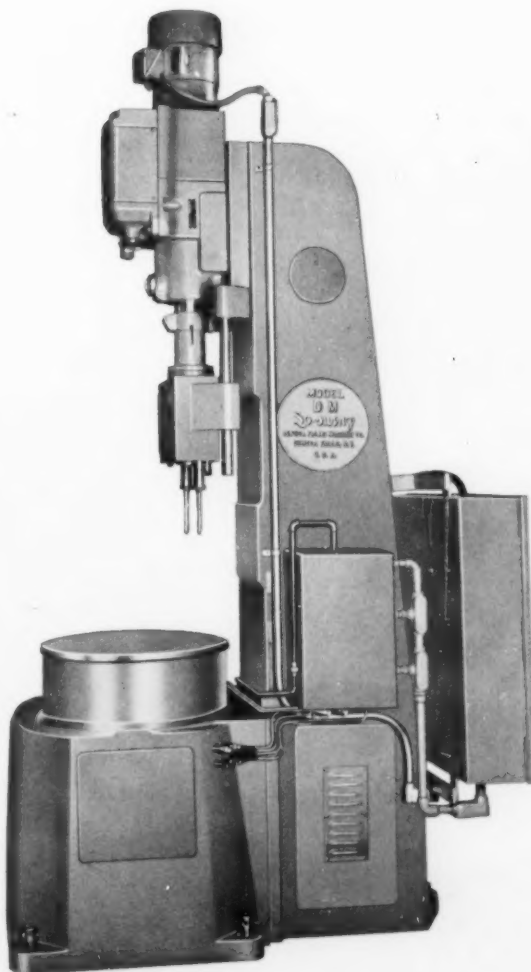
A completely self-contained, simple yet rigid unit operating from a single motor. May be grouped together for any drilling, boring, reaming, counterboring and tapping operations and will operate at any angle. Feed movements are through a lead screw, so arranged as to permit intermittent feeding and rapid traverse during the stroke of the drilling head, thereby reducing machining time on work involving intermittent cutting. The drilling head is cushioned at the end of the stroke to prevent "break through" of the drills. Feed and rapid traverse movements are automatically controlled by adjustable stops. Lubrication is completely automatic. Available attachments permit two rates of drilling feed, desirable when counterboring takes place at the end of the feed cycle. Another attachment permits counterbores to "dwell", for a certain number of revolutions at the end of the cut.

The Seneca Falls Model DM is made from standardized units assembled on a base casting or welded platform. The machine may be composed of one or several drilling heads which in turn may be equipped with single or cluster drilling spindles. The base may be fitted with an automatic indexing fixture to rotate work pieces through a series of stations under the drilling, reaming or tapping spindles. Work pieces are loaded in suitable holding fixtures, and when automatically loaded, two stations on the indexing table are reserved for loading and unloading. A fully-automatic cycle can be utilized, including automatic "pick-up" from a conveyor line, automatic loading, machining and indexing, and finally, automatic ejection of the finished part on another conveyor line.

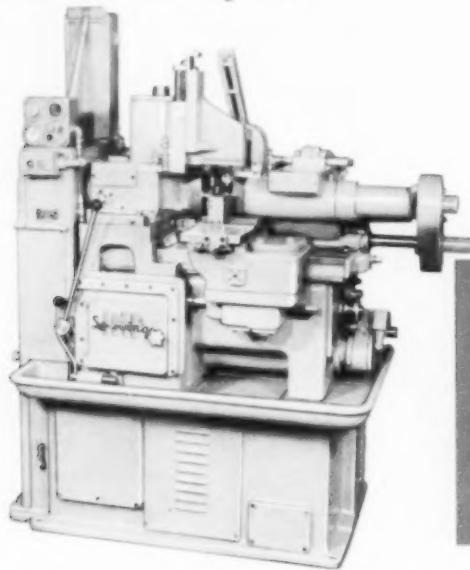
CONDENSED SPECIFICATIONS

Height of machine	110"
Feed of head, maximum	16"
Drilling area of head	20" x 19"
Diameter of indexing table	28"
Spindle speeds	130 to 1150 or 200 to 1750 RPM
Head drive motors	Depends on work piece
Number of spindles	

MODEL DM AUTOMATIC DRILLING AND REAMING MACHINE



AUTOMATED Lo-swing IMP



A Rotary-type Automatic Loader assures a constant flow of pump gears through this lathe, which turns, faces, and chamfers, on a complete automatic cycle. Gears are placed in the loading chute and feed by gravity to openings in the Rotary Loader, which indexes them to proper position. Revolving spindles, which are withdrawn during the indexing phase, then pick them up for machining. The fast revolving gears are completely stationary when they reach the discharge chute.

SPECIFICATIONS OF LO-SWING IMP

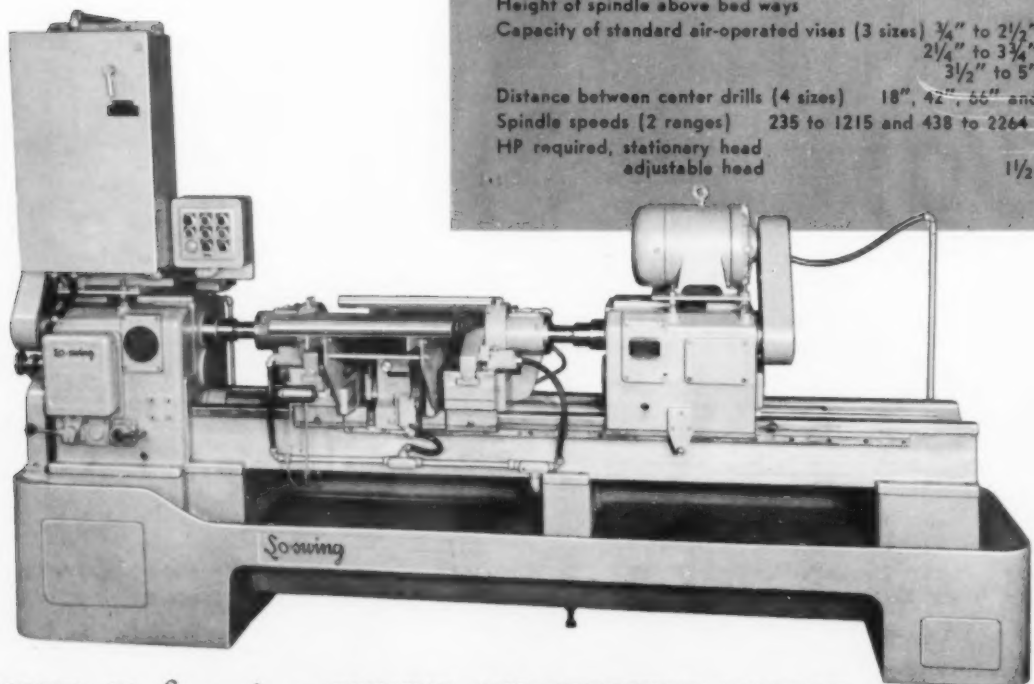
Swing over front & rear slides	4 1/2"
Distance between centers (2 sizes)	8" or 12"
Spindle speeds (3 ranges)	400 to 1750 RPM 800 to 3500 RPM 1020 to 4500 RPM
HP required (depending on job)	3 to 5
Approx. net wt., less tooling & motor	4,000 lbs.

A "Walking Beam" type of Loader and special vises equip this Centering Machine for completely automatic operation. Shafts arrive by conveyor and roll to a fixed stop on the loading rails. The loader has two work carrier arms which operate with a rotating movement and handle both rough and finished pieces simultaneously. As the un-

loading arms remove and eject a finished piece, the loader arms, in their trajectory, pick up a rough piece and lower it into the vise jaws. It is then automatically clamped in position, the feed starting clutch engages and the shaft is centered. At the end of the feed cycle, the center drills retract and the vises open.

SPECIFICATIONS OF MODEL CS LO-SWING

Height of spindle above bed ways	9 1/4"
Capacity of standard air-operated vises (3 sizes)	3/4" to 2 1/2" dia. 2 1/4" to 3 3/4" dia. 3 1/2" to 5" dia.
Distance between center drills (4 sizes)	18", 42", 66" and 90"
Spindle speeds (2 ranges)	235 to 1215 and 438 to 2264 RPM
HP required, stationary head	3
adjustable head	1 1/2 to 3



AUTOMATED MODEL CS Lo-swing DRILLING AND CENTERING MACHINE

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SENECA FALLS, N. Y.

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ADJUSTABLE JAW CHUCKS**

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Sept. 6-17

at the Machine Tool Show

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In a complete range of sizes

THE MONA-MATICS

for high production metal turning

THE HYDRA-SLIDE

for high production chucking
and fixture work

THE SPEEDI-MATIC

a fast, precision hand screw machine

MONARCH-KELLER TURNING MACHINE

THE MONARCH MOTOR-TRACE

THE MONARCH AIR-GAGE TRACER

THE MONARCH ROLL TURNING LATHES

THE MONARCH 60" RIGHT ANGLE LATHE

THE SHAPEMASTER ENGRAVER

PLUS - the New Monarchs —
First Showing

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See the new Monarch Series 90 Dyna-Shift Lathes in action—the Series 62 *Preselector* Dyna-Shift Lathes—the Hydra-Slide (for high production chucking and fixture work)—the fabulous Series EE Model 1000, with features making it the most versatile lathe of its capacity on the market. PLUS an array of completely new cost-cutting lathes to be presented for the first time at the show.

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THE TAFT-PEIRCE

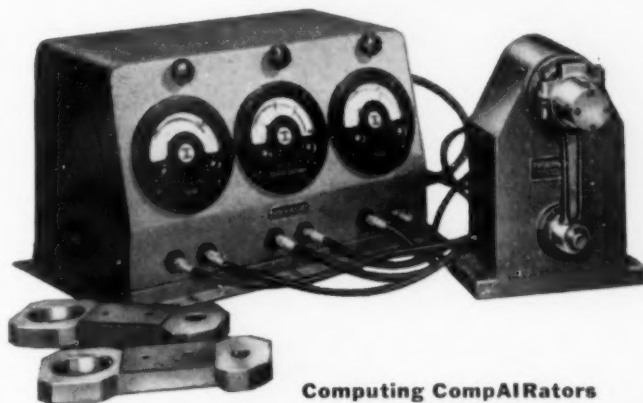
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THERE'S A T-P COMPAIRATOR FOR EVERY INSPECTION NEED



CompAIRators

Available in single, double, or multi-dial units. Can be used with standard air plugs (for through-holes, counter-bores, or blind holes), air rings, and air snap gages — directly attached to cabinet, or to extension hose. Contact type members permit air gaging of rough surfaces. Special fixtures designed and built to order.

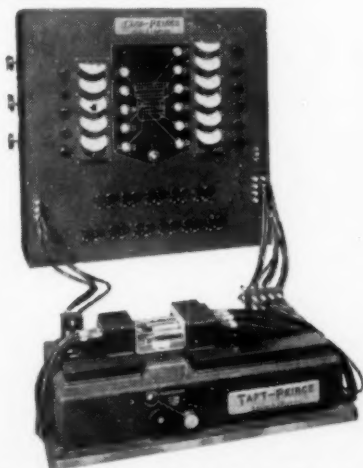


Computing CompAIRators

For measuring such relationships as squareness or center distance, a Computing CompAIRator eliminates making two separate measurements and a calculation. Does the whole job — measures, computes, and indicates the result instantly on a single dial. 3 dial unit above replaces 6 ordinary indicators.

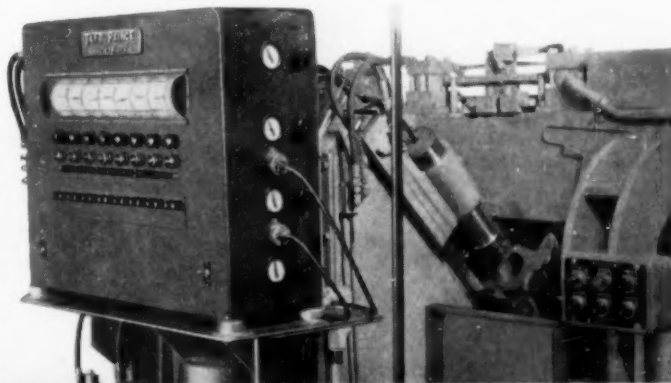
Air-Electric CompAIRators

For rapid inspection of a number of dimensions. Lights indicate any dimension out of tolerance. Exact reading can be then taken from proper dial face. Compact angular mounting of dials, either horizontally or vertically, speeds and simplifies reading.



Automatic CompAIRators

Easily incorporated into production lines where maximum speed of inspection is required. Automatically checks parts, rejects off-size work. Can be built directly into high production machine tools to actuate size control mechanism.



MANUFACTURING CO.
WOONSOCKET, RHODE ISLAND



*T-P means
Top Precision*

metalworking history will be made by

NIAGARA PRESSES, PRESS BRAKES

in action!

Watch them operate. Examine them. See a revolution in metalworking with these modern wonders in action. You'll be electrified by brand new machines never before exhibited, stirring new developments on conventional machines and engineering marvels in press automation.

Truly, Niagara promises you the greatest demonstration of the word "New" in the whole Machine Tool Show.

And everybody — yes, everybody — top management and all — will be on hand to give you a warm greeting and a full explanation of anything you wish to know about history-making Niagara machines. Come early, while you're fresh. There's so much to see!

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.



NIAGARA

AND SHEARS



MAIN EVENT

Booth No. 715

THE
MACHINE TOOL
SHOW

CHICAGO, ILL.
SEPT. 8-19, 1955

INTERNATIONAL AMPHITHEATRE



NEW DESIGNS

NEW LINES

NEW STAMINA

NEW ECONOMIES

NEW OPERATING EASE

NEW SAFETY

NEW CAPACITIES

NEW PRODUCTIVITY

See these new

SUNDSTRAND

Machines *in action* at the
Machine Tool Show

Sept. 6-17, 1955

International
Amphitheatre
Chicago, Illinois

**BOOTH
1412**

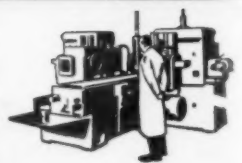
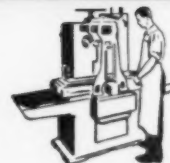
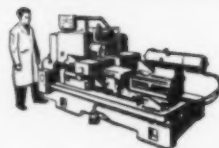


AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS



50 YEARS OF
"Engineered
Production"
Service*

*REG. U.S. PAT. OFF.

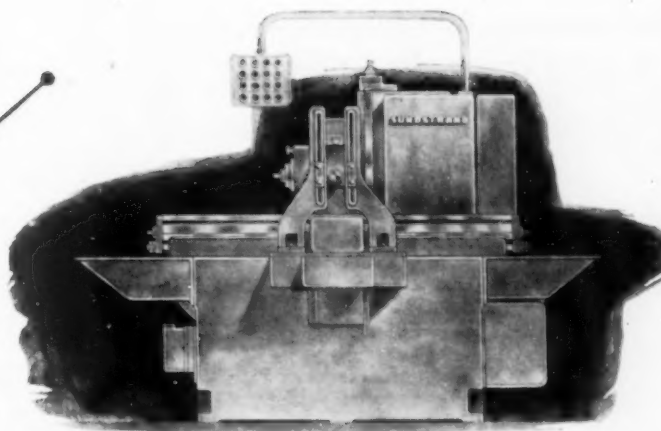


See In Action

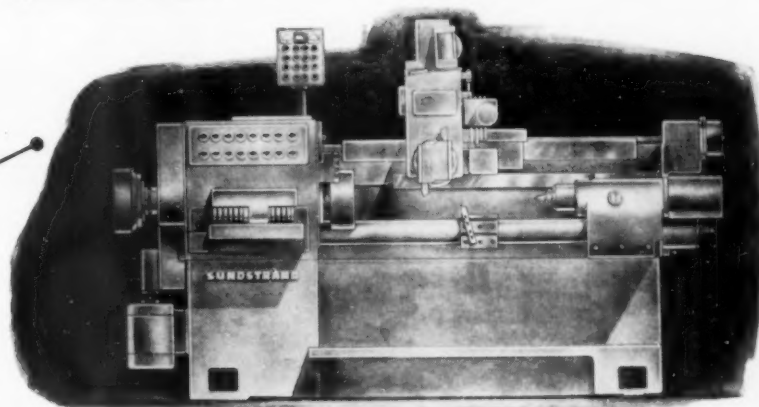
- 1 The new line of Sundstrand Rigmils
- 2 Punch card control of a multi-cycle lathe
- 3 Carbide milling of die blocks
- 4 Tracer turning with the new Sundstrand Automatic Multi-Cycle Tracer Control Unit
- 5 Low cost milling and centering of shafts

... Get an
"Engineered Production"

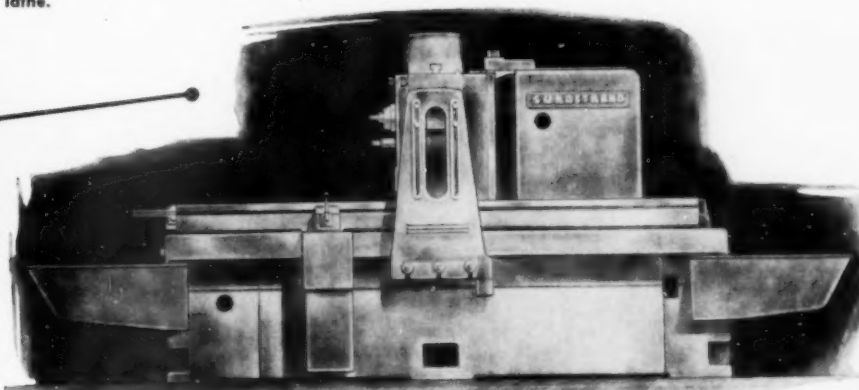
analysis of how these new machines can improve your production and lower costs.



New 5 H.P. Model C1
Hydraulic Feed RIGIDMIL

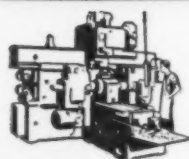


New 40 H.P. multi-cycle
single point production
lathe.

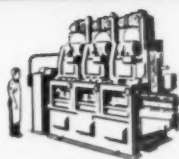


New Model C3 RIGIDMIL
with mechanical feed.

TRIPLEX RIGIDMILS



SPECIAL MACHINES



SUNDSTRAND
Machine Tool Co.

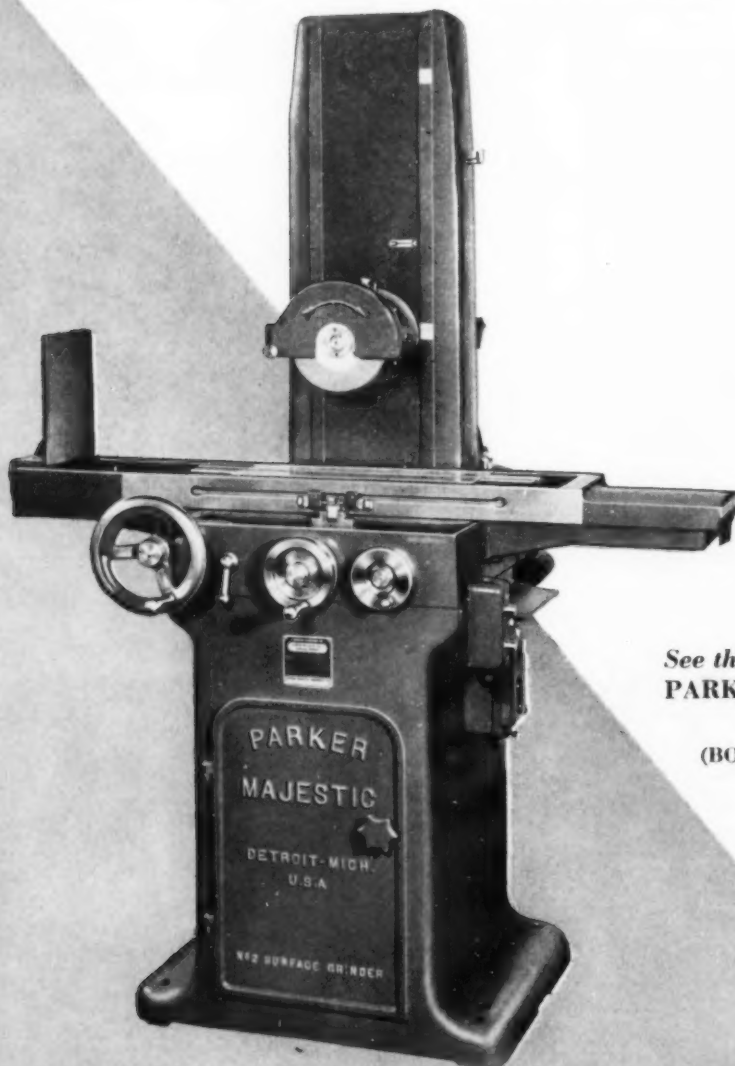
2540 Eleventh St. • Rockford, Ill., U.S.A.

PARKER • MAJESTIC



PRECISION MACHINES

NO. 2-Z SURFACE GRINDER



See the
PARKER-MAJESTIC
exhibit } at
(BOOTH No. 415)

Elevating hand wheel mounted in saddle.
Motorized drive for rapid spindle elevation.
Handwheel graduated directly in .0001" increments.

DESCRIPTIVE LITERATURE ON REQUEST

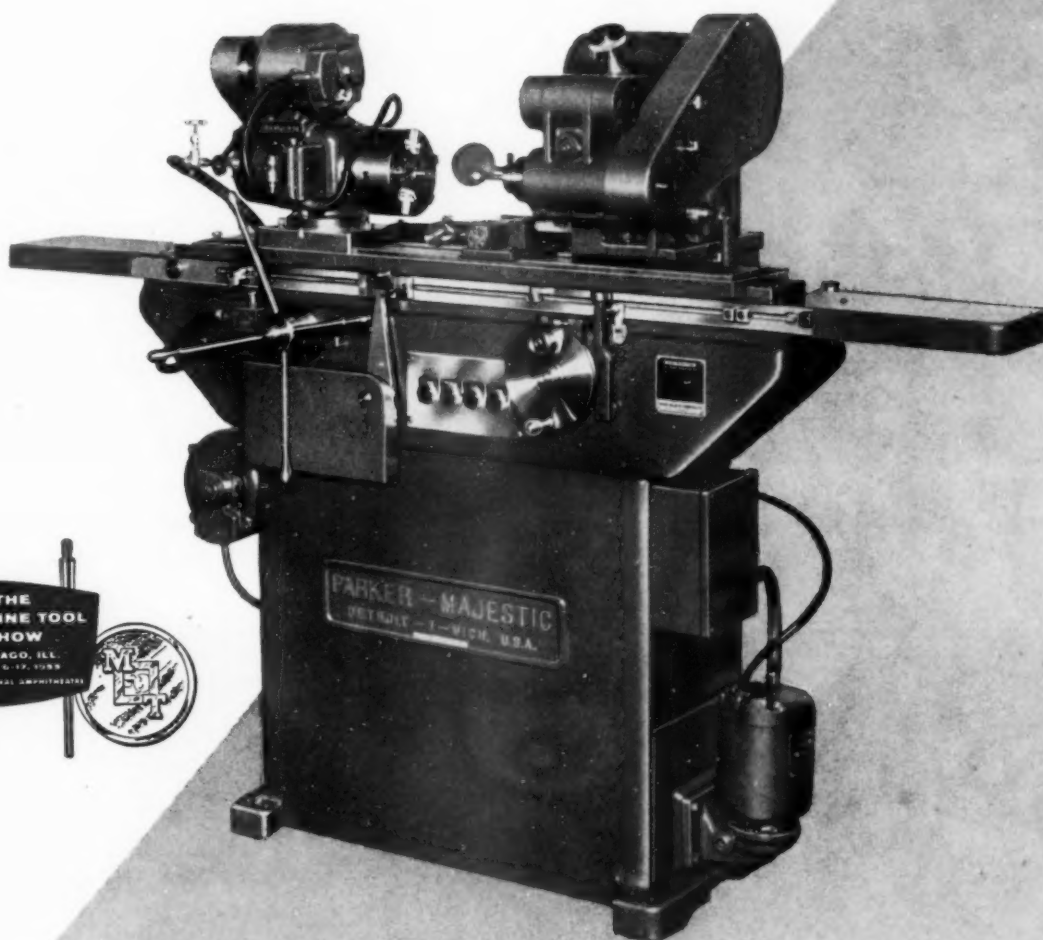
PARKER-MAJESTIC, Inc.
147 JOS. CAMPAU, DETROIT 7, MICH.

PARKER • MAJESTIC



PRECISION MACHINES

SEMI-AUTOMATIC INTERNAL GRINDER



Accurate automatic sizing for production or semi-production.

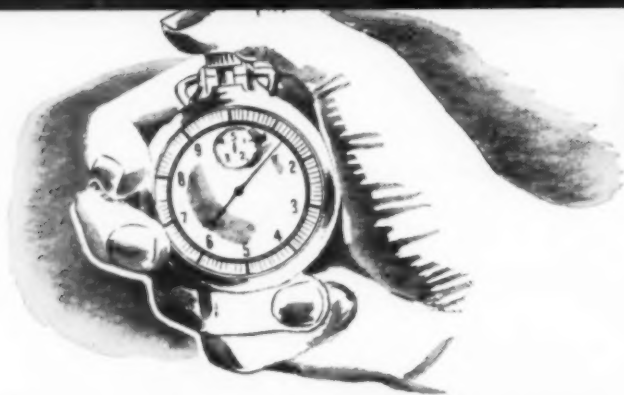
Cam actuated spindle infeed.

Micrometer type wheel dresser facilitates size control.

Models available in 12" or 24" table travel.

DESCRIPTIVE LITERATURE ON REQUEST

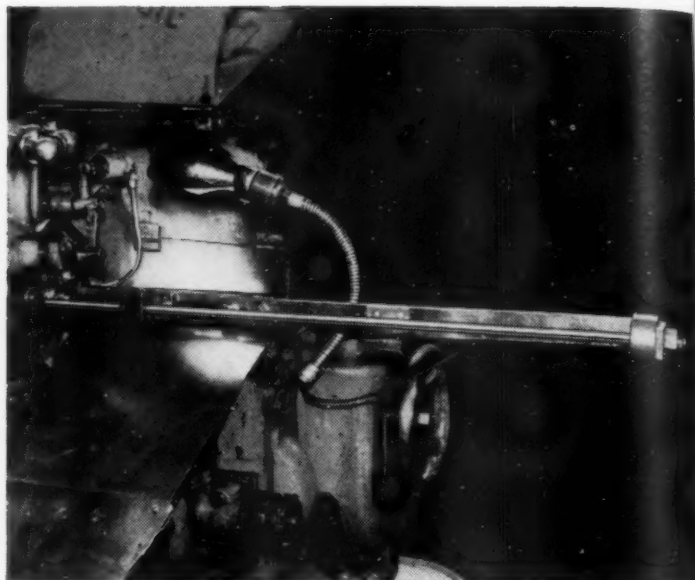
PARKER-MAJESTIC, Inc.
147 JOS. CAMPAU, DETROIT 7, MICH.



Why let the cut



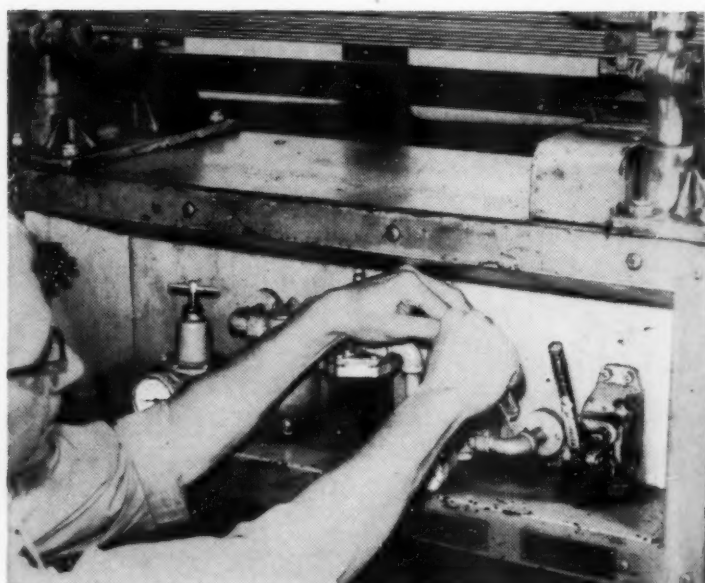
**Feeds Stock Continuously . . .
there's no cutting air**



**No Repeat Motion . . . feeds any
length in one feed-out**



**Reduces Scrap, Refinishing . . .
doesn't scratch or mar polished stock**



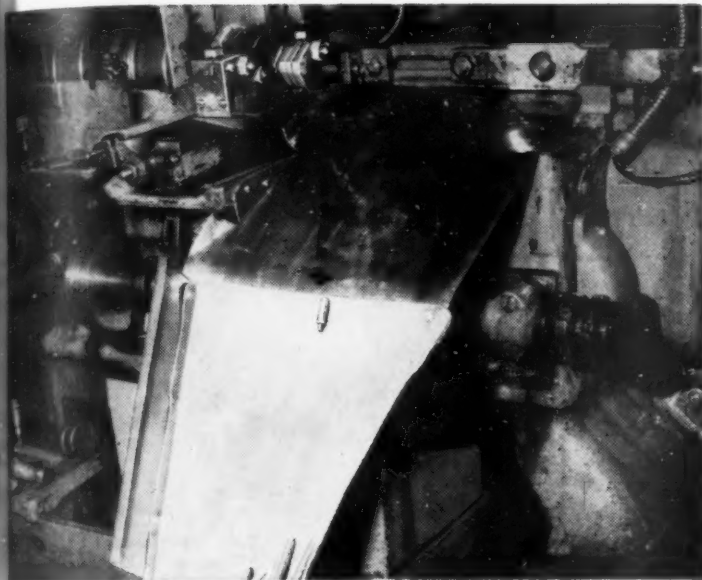
**Allows Quick Set-Ups . . . no tricky
adjustments for long or short runs**



Lipe-ROLLWAY CORPORATION

**BAR FEED
DIVISION**

4th Dimension your production quotas?



Ejects Remnant Automatically . . .
no shut-downs for remnant disposal



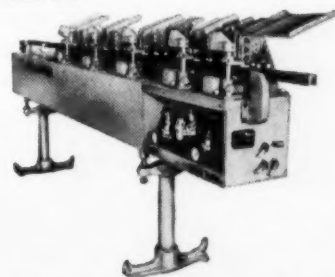
Reduces Fatigue, Slow-Downs . . . cuts
nervous strain and absenteeism

LiPe A.M.L. BAR FEED **boosts output 30% or more** **by smashing the TIME barrier**

You're familiar with the three spatial dimensions on blueprints: length, width and height. But what of TIME—the important 4th Dimension that determines whether you hit or miss your production quotas?

Control Time as you control the other three dimensions—make every second perform a productive function—and you're on your way to more efficient machine use . . . new production highs . . . lower per-piece costs!

The LiPe A.M.L. (Automatic Magazine-Loading) Bar Feed converts the normal series of stop-wait-go machining cycles into one continuous, uninterrupted flow. Despite hour of day, temperature, inattention, operator skill or fatigue, it supplies stock constantly to the machine—never losing a productive second as the clock ticks on.



LIPE A.M.L. BAR FEED

The A.M.L. is an air-operated attachment which automatically feeds an 8-hour supply of bars, rods or tubing to any machine tool equipped with a stop to establish feed length. It can be put to work on practically every type of single spindle screw machine, turret lathe, centerless grinder, abrasive-wheel cut-off, punch press, cold header or die machine.

You can expect at least a 30% increase in production—that's LiPe's *guarantee*. Users report gains up to 266% due to the six features illustrated on the left. The whole story of what the A.M.L. can do for you is described in a free booklet we'll be glad to send you. Mail coupon for your copy.

LIPE-ROLLWAY CORPORATION
Bar Feed Division
Syracuse 1, N. Y.

Please send free 24-page illustrated booklet, "The Important 4th Dimension of Production and Profit."

Name.....
Title.....
Firm.....
Address.....



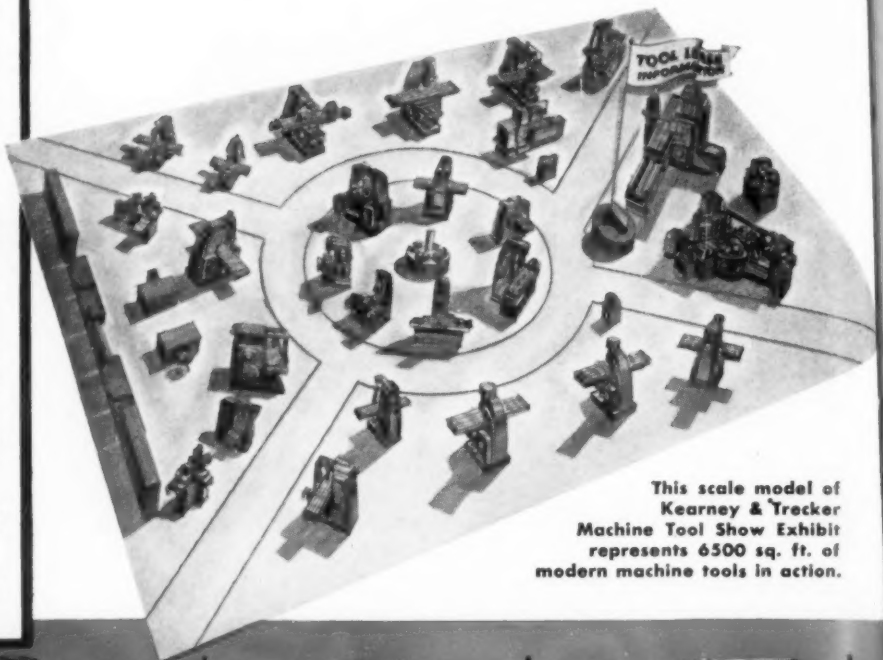
SYRACUSE 1, N. Y.

KEARNEY & TRECKER

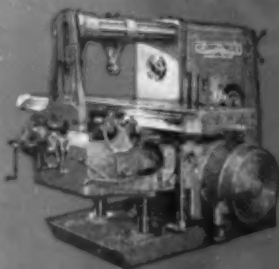
expansion and new

See these outstanding machines in Booth 508

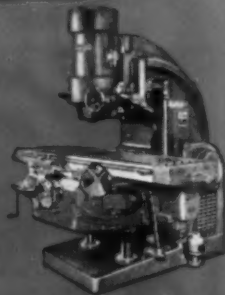
- ★ **New TK Series Milling Machines** — incomparably modern titans of general purpose production!
- ★ **New TF Series Milling Machine** — strikingly new models featuring remarkable twin-screw knee support.
- ★ **New Model CE Milling Machines** — the simplified, precision-built, economy producer for schools, maintenance and small tool work.
- ★ **New Ram Head Milling Machines** — versatile performers featuring combination arrangements of horizontal, vertical and universal spindles.
- ★ **New Mil-waukee-Mil Series Milling Machines** — flexible, power laden, broad capacity, bed-type production tools.
- ★ **New Autometric Precision Boring Machines** — superb vertical models introducing a non-wearing twin-screw measuring system.
- ★ **New Automatic Transfer Machines** — Quill Feed unit, Way-Type Drilling unit, Lead Screw Tapping unit, Rotary Index Table, Feed Slide.
- ★ **New Compudex** — the precision indexing computer for rotary tables and dividing heads.
- ★ **New Tri-D Rotary Milling Head** — the amazing attachment which will produce almost any geometric shape in metal.



This scale model of Kearney & Trecker Machine Tool Show Exhibit represents 6500 sq. ft. of modern machine tools in action.



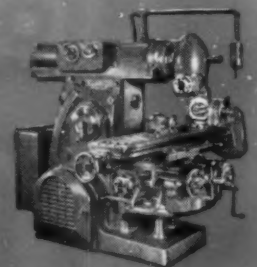
NEW TK SERIES Milling Machines — Available in four sizes Plain and Vertical styles . . . power from 20hp to 50hp.



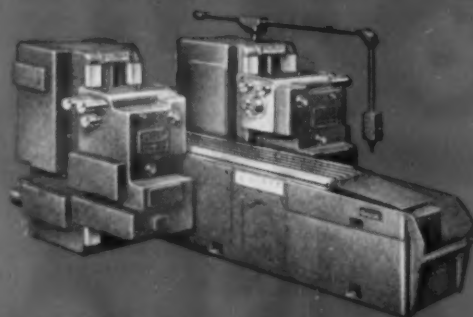
NEW TF SERIES Milling Machines — Available in five sizes Plain, Universal and Vertical styles from 10hp to 50hp.



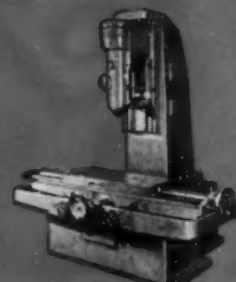
NEW MODEL CE Milling Machines — Available in either 3hp No. 2 or 2 1/2hp No. 3 size, both in Plain and Universal styles.



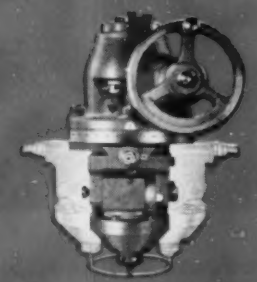
NEW RAM HEAD Milling Machines — Built in 21 different machine sizes and styles from No. 2 to No. 4, Plain and Universal.



NEW MIL-WAUKEE-MIL Production Milling Machines — over 300 combinations available in Simplex and Duplex styles.



NEW MODEL C AUTOMETRIC Vertical Precision Boring Machines — Two sizes, No. 3 and No. 4. Also available in horizontal style, No. 2.



NEW TRI-D MILLING HEAD — Plain, rotary and angular milling made easy. Adaptable to almost any make of horizontal and some vertical milling machines.

Unfolds results of \$18,700,000 product development program

An extraordinary investment to bring you MORE PRODUCTIVITY and QUALITY . . . GREATER ECONOMY and PERFORMANCE in the new machine tools you buy from KEARNEY & TRECKER

Yes, the 1955 Kearney & Trecker Machine Tool Show story reflects a tremendous investment any way you look at it—\$3,500,000 in new buildings and facilities; \$8,900,000 in new tools and equipment; \$6,300,000 in research and new product development.

And at the Show you'll see the positive results of this unprecedented eight-year growth and development program. You'll see 31 unusual exhibits featuring among them not one, but four new lines of knee-type milling machines comprising 81 different models, styles and sizes; an entirely new line of medium size bed-type production milling machines with electro-hydraulic pendant control; a new group of vertical precision boring machines; new attachments for rotary

milling and precision index computing; automatic transfer type equipment — all of this and more to be seen and demonstrated in Booth 508.

Today, Kearney & Trecker offers you standard and special production machines that can meet any of your needs — with more productivity and quality, with greater economy and performance than ever before. What's more, you can obtain new machines either by outright purchase, conditional sales agreement or any of three Kearney & Trecker Tool-Lease plans.

See or write your nearest Kearney & Trecker representative. He'll be glad to discuss your production requirements and what these new Kearney & Trecker machines can do to meet them.



NEW 12-STATION AUTOMATIC TRANSFER MACHINE — It mills, drills, reams, taps, spotfaces and saws apart integrally-cast bearing cap blocks at production rate of 73 sets per hour.



NEW GANTRY-TYPE WING SKIN TRACER-CONTROLLED MILLING MACHINE — A 125-ton, 360° and rise and fall functioning giant of production, which is typical of recent Kearney & Trecker developments for the aircraft industry. Similar machines can be seen in operation at Kearney & Trecker's new Special Machinery Division plant in Milwaukee during the Show.



BUILDERS OF PRECISION AND PRODUCTION MACHINE TOOLS SINCE 1898

TAPS *and* GAGES *by* CARD



Now, Card brings you a select line of gages along with renowned Card taps. You can specify and use both with complete confidence, knowing that whatever the job demands, you'll get top performance. We assure you that the new line of gages boasts the same quality of manufacture that has made Card taps famous over the past 81 years.

Contact your local Card Distributor for prompt deliveries and helpful service.



S. W. CARD MANUFACTURING CO. MANSFIELD, MASS.
Division of Union Twist Drill Co. TAPS • DIES • SCREW PLATES • GAGES

Booth 520 at the show

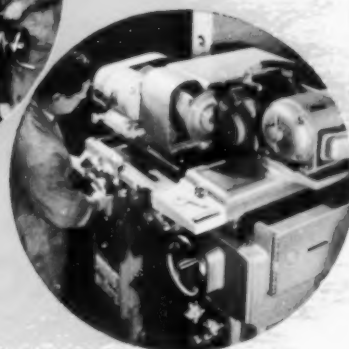
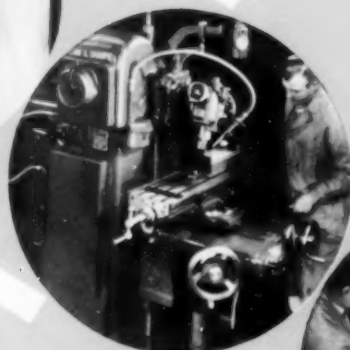
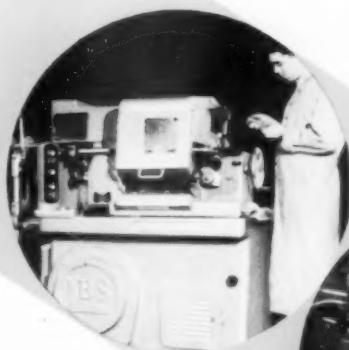
**Dynamic advances
on all fronts
by *Brown & Sharpe***

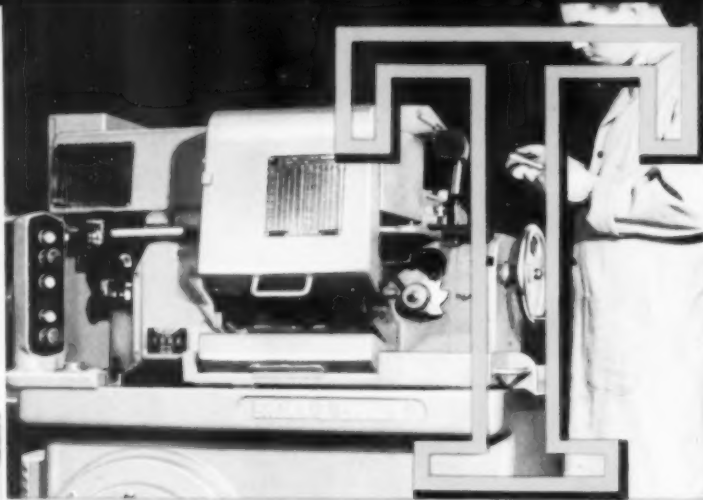
NEW screw machine productivity

NEW milling flexibility

NEW grinding versatility

NEW ease of precision measurement



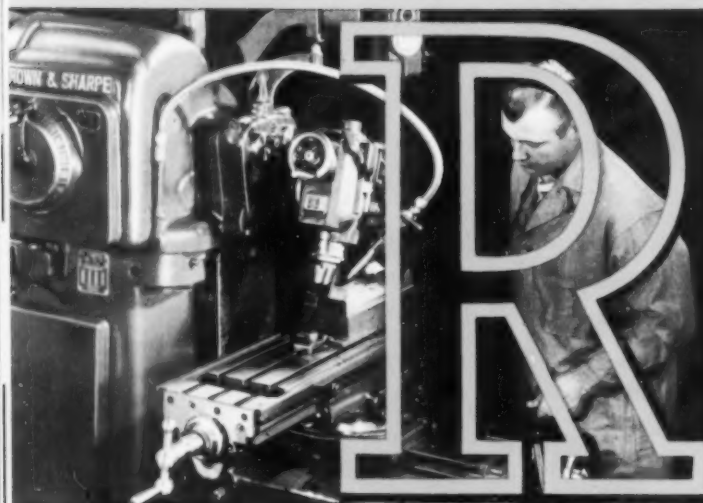


he Fastest

*as much as
60% higher output*

Advanced-Design Screw Machine Tools!

*... new convenience,
capacity, and ruggedness.*

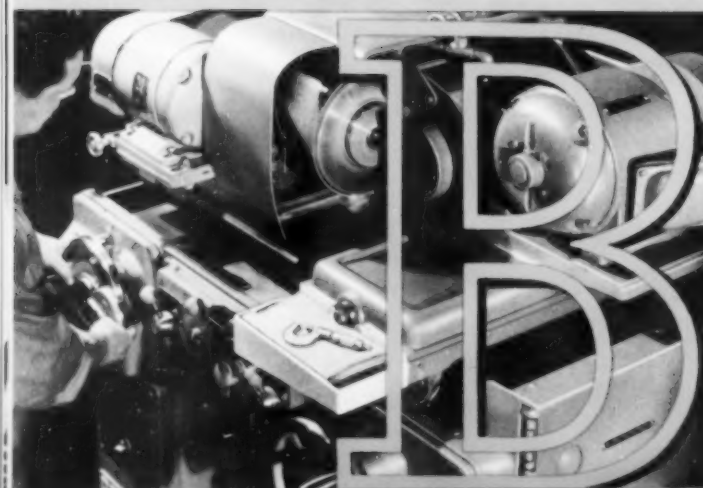


angemaster!

*unique new milling
machine with
unusual range*

Sensational Rubber-Flex* Collets!

*... a "super-grip" for Brown & Sharpe
Nos. 0 & OG Automatics
and the 0 Hand Screw Machine*



rand-New

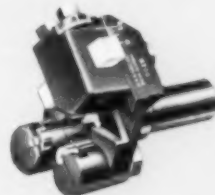
*new horizontal-spindle
face grinder combines
exclusive operating
and production features*

Automatic in its Range!

The new Brown & Sharpe No. 00 Automatic Screw Machine. The most advanced automatic on the market for stock up to $\frac{1}{2}$ " diam.! Push-button controlled. Speed range from 7200 to 34 rpm with 208 spindle speed combinations. Turning length to 1"; up to $1\frac{1}{2}$ " with extra equipment. Carbide tooling where desirable.

See this dynamic Brown & Sharpe advance at the Show!

Nine new 00-size Brown & Sharpe Screw Machine Tools loaded with extra-efficiency features! Illustrated Style 4 Box Tool with exclusive micrometer scale graduations is typical. All nine tools feature increased capacity to $\frac{1}{2}$ " max.; faster, easier adjustments; greater strength and durability. See this dynamic Brown & Sharpe advance at the Show!

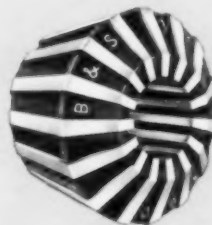


New Brown & Sharpe No. 20 Universal Milling Machine—Sliding Head Type.

Creates a new work-range concept for a single machine! Simplest machine of its kind to set up and operate! Vertical spindle utilizes full power on all work; has 18 speed changes from 80 to 3060 rpm. Exclusive features: Quill feed and universal movement give 360° range in two planes without extra attachment. Head swings out of way on crane when idle. Both spindles on same vertical centerline. Massive 22" ways for sliding head. Sustained high-accuracy milling in any work position! Also available as No. 20 Plain Milling Machine. See this dynamic Brown & Sharpe advance at the Show!

The revolutionary collets with a far more powerful, more uniform grip than conventional spring-type collets! Steel inserts, permanently bonded to rubber, actually "tighten" their grip as power of a cut increases. Each collet has .050" range. Set of only 13 covers spindle capacity from .100" to .750"! See this dynamic Brown & Sharpe advance at the Show!


**Rubber-Flex is a trademark of the Jacobs Manufacturing Company.*



Angle!

The new Brown & Sharpe No. 11 Face Grinding Machine. A brand-new approach to grinding of flat, concave, or convex surfaces! Handles work up to 10" in diameter and $4\frac{3}{4}$ " thickness. Horizontal work axis assures highest quality surface. Fast lever-controlled chucking. Set-diamond dressing. Pre-set grinding and dressing speeds.

See this dynamic Brown & Sharpe advance at the Show!

Brown & Sharpe 

INVESTIGATE OUR PAY-AS-YOU-DEPRECIATE MACHINE TOOL PURCHASE PLAN



America's Most-Advanced Vernier Caliper!

*... eliminates
reflections,
cuts reading and
aligning time*

Here's the most easily-aligned, most easily-read, most durable Vernier Caliper! Jet-black, machine-cut graduations and figures on dull-chrome, recessed background give extra-vivid contrast without reflections. New Super-Vernier Plate is twice as long . . . twice as easy to read! All bearing surfaces protected by hard chrome finish. *See this dynamic Brown & Sharpe advance at the Show!*

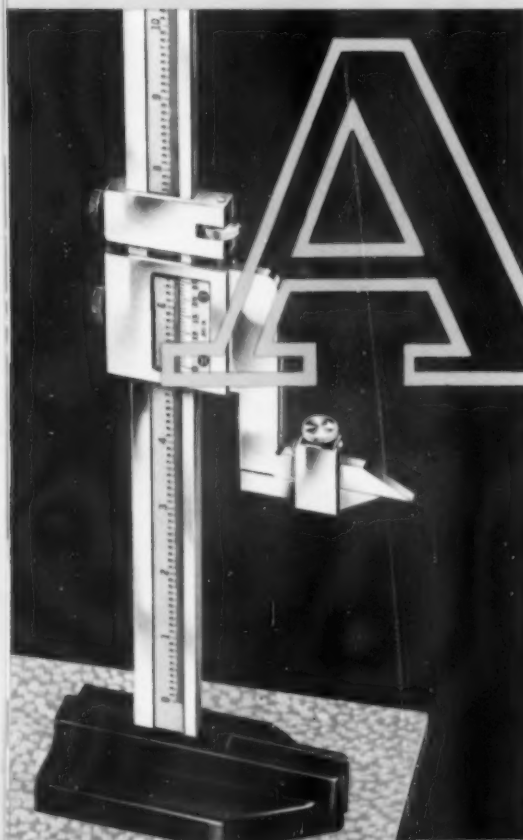


Brown & Sharpe

Brown & Sharpe Mfg. Co. • Providence, Rhode Island



MILLING MACHINES
GRINDING MACHINES
SCREW MACHINES
CUTTERS
MACHINE TOOL ACCESSORIES
MACHINISTS' TOOLS
ELECTRONIC MEASURING EQUIPMENT
JOHANSSON GAGE BLOCKS
PERMANENT MAGNET CHUCKS
PUMPS



America's Most-Advanced Vernier Height Gage!

*... full use of
scale to zero
... no need to
invert marker*

An exclusive combination of high accuracy and ease-of-use for vertical measurement! Slotted base allows full use of scale to zero. Fixed top marker for over-surface work. For under surface, simply loosen clamp nut and slide bottom marker forward. Has Super-Vernier Plate and all the high-contrast features of the Vernier Caliper. *See this dynamic Brown & Sharpe advance at the Show!*



why you should put **SUPERFINISH** in your blueprints

Longer life, better performance—yes, and *lower costs, too*—should be engineered into the product at the start. For example: when you specify Gisholt SUPERFINISH, you accomplish two things: First, you assure a bearing surface free of the imperfections that cause wear—a surface that will last indefinitely. Second, you cut the cost of grinding—or even eliminate it. Surprisingly enough, you can in most cases achieve this superlative finish at lower over-all cost than is possible with other methods of finishing.

HAVE YOU A COPY OF THIS BOOK?

It's the most complete and authoritative textbook ever published on this important subject. So popular, it is already in its third printing. Fascinating, fully illustrated, yours for the asking. Use the coupon.



GISHOLT
MACHINE COMPANY
Madison 10, Wisconsin



THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

Gisholt Machine Company
Madison 10, Wisconsin
Gentlemen:
Please send my free copy of "Wear and Surface Finish."

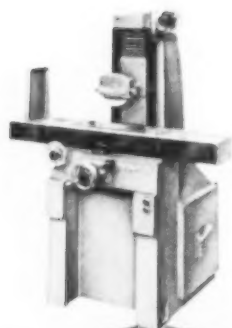
Name.....Title.....

Company.....

Street Address.....

City.....State.....

TURRET LATHES • AUTOMATIC LATHES
SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

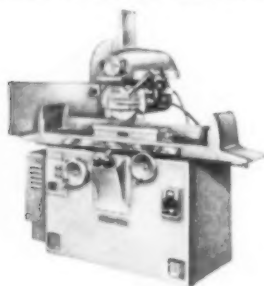


TYPE D
HAND FEED SURFACE GRINDER

Completely anti-friction design and permanently lubricated. Available with interchangeable vertical and horizontal spindle attachments.

from the new hand feed baby

TYPE 2F
HYDRAULIC SURFACE GRINDER



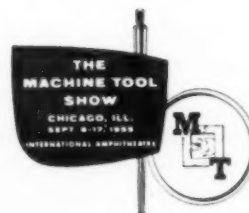
Tool room and production grinder with new coolant application both through the wheel and externally.

Thompson



PRECISION PETE SAYS:

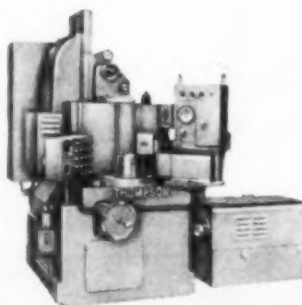
"Everybody knows Thompson Grinders are the very highest quality ... but in addition you'll find that they cost no more than many other grinders ... Buy Thompson for quality and price!"



BOOTH NUMBER
1407

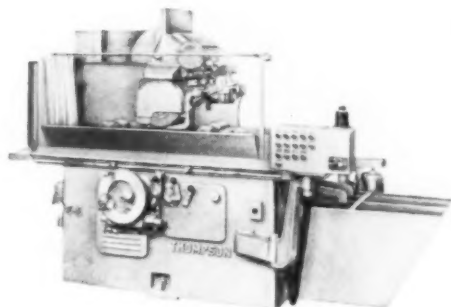
6" TWIN ROTARY GRINDER ...

with automatic control and automatic gauging.



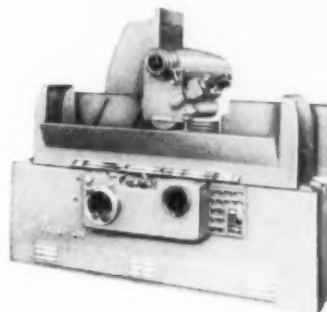
MODEL B TRUFORM GRINDER...

the latest 12" x 20" contour grinding machine with automatic crushing and truing cycle.



TYPE G
HYDRAULIC SURFACE GRINDER...

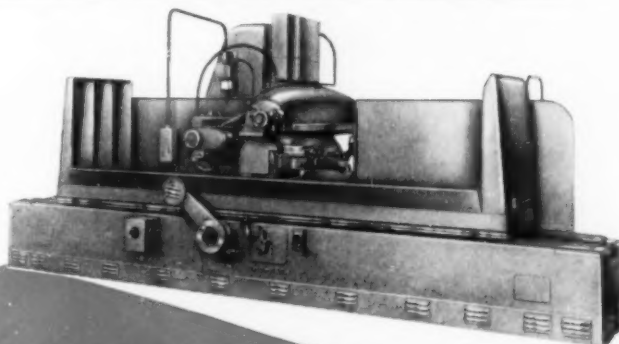
a deluxe surface grinder in
12" x 16" x 36" size range.



*...invites you to see the newest
developments in Surface Grinders.*

TYPE CX
DOUBLE HEAD WAY GRINDER

way grinder, 36" x 36" x 120", with
both horizontal and vertical heads.



...to the two headed giant

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Grinders**

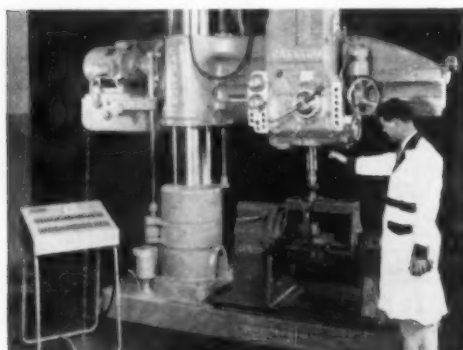
THE THOMPSON GRINDER COMPANY • SPRINGFIELD, OHIO

September 1955

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-71

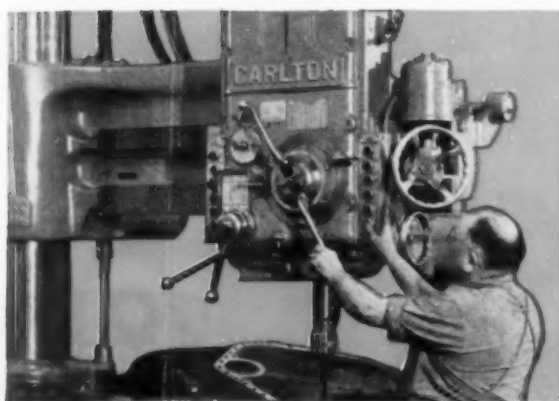


Setting speeds and feeds made as easy as tuning a radio . . . so simple any one can pre-set it.



Operator is free to concentrate on starting and stopping spindle, changing cutting tools . . . speeds and feeds have all been pre-set.

Carlton Radial Drills now come with your choice of 3 different



1 *Manual gear shift:* 2 shifter levers for controlling speeds, 2 shifter levers for controlling feeds.



2 *Pre-select gear shift:* 1 speed graduated dial and 1 feed graduated dial pre-set speeds and feeds.

*now you can plan and
... with the new*

Carlton

The Carlton Machine Tool Co. announces the introduction of the new Carlton-Leber speed-feed pre-selector and program systems. The two new devices offer faster, and therefore more economical hole drilling production.

Programming Here's how the Carlton-Leber programming works: your production engineering department studies the workpiece drawing and determines the sequence of drilling operations and the correct speed and feed for each. This data is recorded on a routing sheet or blueprint

pre-set speeds and feeds for an entire drilling program

n programming

and is transferred to the programming console.

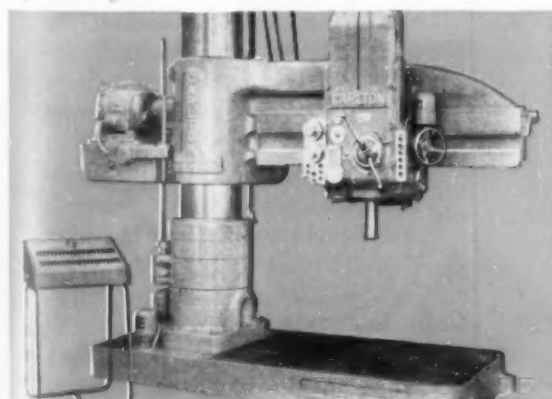
The programming console contains an indexing dial which shows the operation sequence number being performed. Operator has local control and can perform operations out of sequence by manually advancing or reversing the indexing dial.

Pre-selector For less lengthy or complicated drilling jobs, the programming unit can be disconnected through a selector switch and the pre-selector then becomes operative. The pre-selector saves time by allowing operator to select the

speed and feed for the next operation while the machine is under cut. Pre-selector may be furnished with or without the programming unit. In fact, you can now buy your Carlton radial drill with your choice of one of three different types of speed-feed control as illustrated below.

Be sure to see the new Carlton-Leber pre-selector and programming devices in action at the Machine Tool Show in Carlton booth 919. In the meantime, write for your descriptive bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio, U.S.A.

speed-feed controls . . .



3 **Pre-selector and programming gear shift** sets up correct speeds and feeds for a complete sequence of operations.

Carlton

horizontal and radial drills



You're invited . . . to see the new Carlton-Leber pre-selector and programming devices. Visit us in booth 919 at the Show.

New High-Torque Unbrako self-locking socket set screws

set them, forget them—they stay tight

*Up to 40% higher
tightening torque—
a new Unbrako feature*

RECOMMENDED SOCKET SET SCREW
TIGHTENING TORQUES
(Inch-Pounds)

SCREW SIZE	UNBRAKO	B	C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

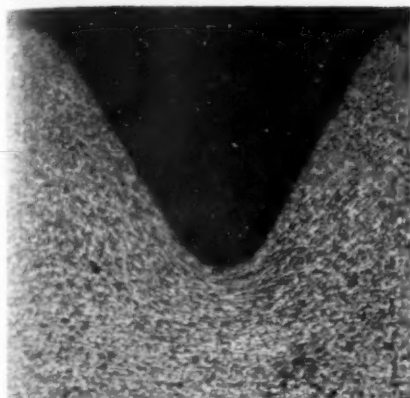
All UNBRAKOS can withstand higher tightening torques than ordinary set screws. For example, the recommended torque for a 1/4" UNBRAKO is 87 inch-pounds—40% greater than that recommended for an ordinary set screw.

Research has proved that the tighter you seat a set screw the better it works. We went to work to design a socket set screw that could be tightened tighter than ever before without damaging the screw.



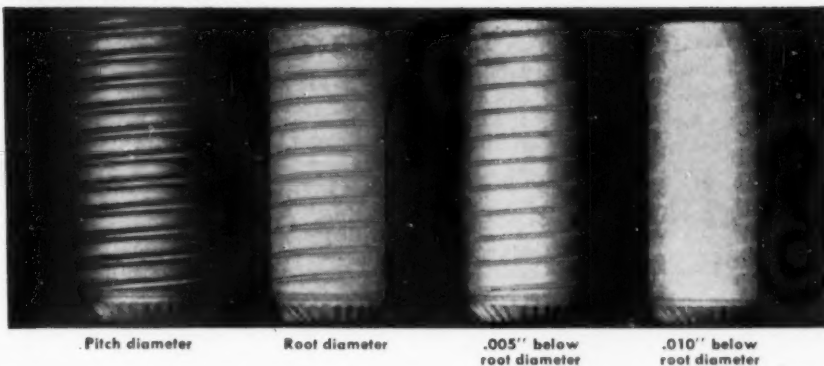
We formed a deeper socket. We put a radius in the socket corners. We developed fully formed threads. We established new methods of heat treatment in atmosphere-controlled furnaces. It took almost 6 years' research and development, but the new High-Torque UNBRAKO incorporates all of these improvements. And it retains the self-locking knurled cup point that keeps an UNBRAKO tight up to 48 times as long as a plain cup point set screw, regardless of the size of the point or the cup.

UNBRAKO SET SCREW

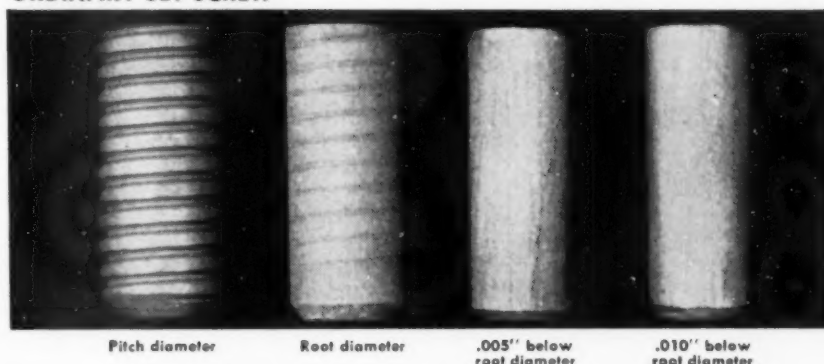


We fully form the threads—make the whole screw stronger. The metal is compressed into the closely knit grain structure that you see in this illustration. The grain flow follows the contour of the threads. There are no straight lines along which shear can occur. The UNBRAKO retains its flow lines even when ground down to .010" below root diameter. Screws with cut or ground threads lose thread form at root diameter.

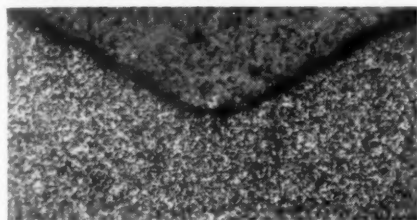
UNBRAKO SET SCREW



ORDINARY SET SCREW

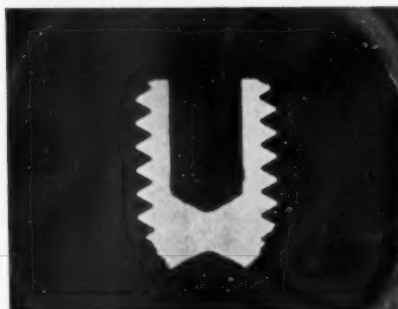


UNBRAKO SET SCREW



We put a radius in the socket corners—eliminate the sharp corners where cracks start. This distributes the stresses developed when tightening torques are applied. Ordinary socket screws have sharp corners which often crack when tightened even at lower recommended torques.

UNBRAKO SET SCREW



ORDINARY SET SCREW



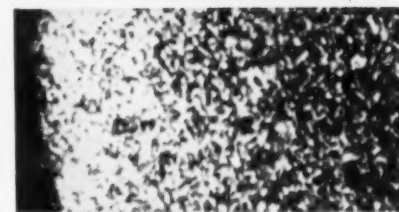
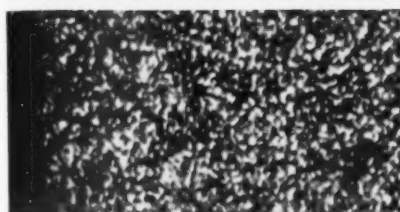
UNBRAKO SET SCREW



ORDINARY SET SCREW



We form a deeper socket—give you more purchase with the wrench. Since more wrench can be put into the UNBRAKO socket, you can set the screw much tighter. And you won't ream the socket or round the corners of the wrench.



We heat treat an UNBRAKO properly. It's a ticklish job to heat treat a socket set screw. If you don't do it just right, you get decarburization. And decarb plays havoc with a screw. Put a wrench in the socket and you ream it. Run the screw into a tapped hole and you strip its threads. Try to seat the screw and its point shears off. These photos show the good and the bad. The UNBRAKO is clean. Its grain structure is uniform. There is no decarburization—the ordinary screw is suffering from an overdose of it, socket walls, threads and point are full of the telltale white spots.

You can't buy another set screw as good as an UNBRAKO. See your authorized industrial distributor today. Or write STANDARD PRESSED STEEL CO., Jenkintown 37, Pa.

Visit Booth 828 at the Production Engineering Show—
see the new UNBRAKO High-Torque Socket Set Screw demonstrated



SOCKET SCREW DIVISION



JENKINTOWN, PENNSYLVANIA



See these Norton machines at the Chicago show

The machines described here will be shown in the Norton exhibit at the Chicago Machine Tool Show — Booth No. 516.

These advanced machines are only a small fraction of the world's largest line. Norton produces a wide range of cylindrical, surface and tool room grinders, lapping machines, crankshaft and camshaft grinders and special types for grinding pistons, valves, jet parts, etc.

Remember, only Norton offers you such long experience

in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. Why not replace your obsolete grinding and lapping equipment with new Norton machines — and meet competition with the best production tools in the field? See them at the show, call your Norton representative for full details, or write direct.

NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

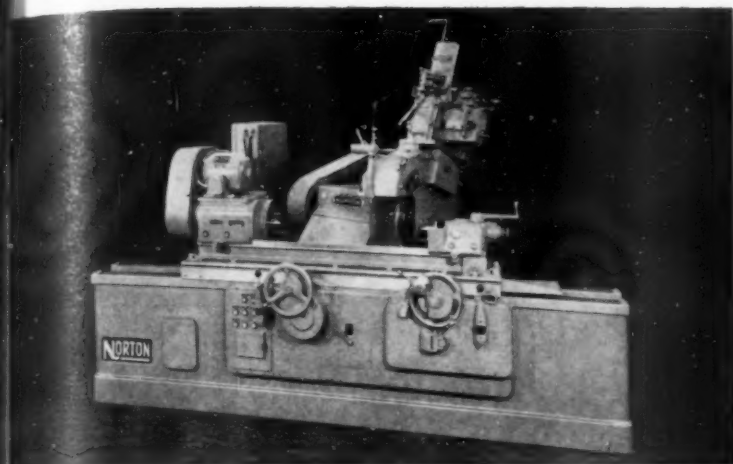


Automation in crankpin grinding . . . another Norton "FIRST"

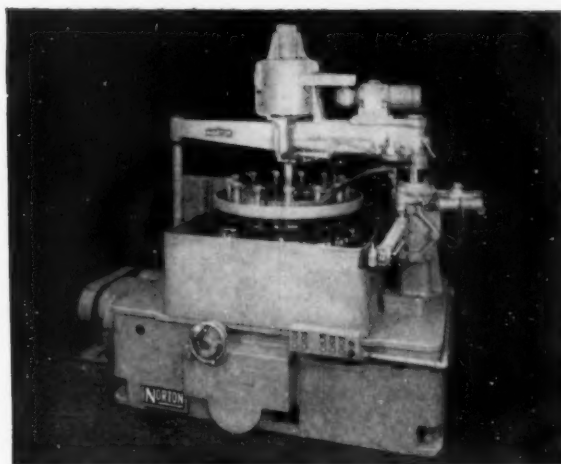
Outstanding in the Norton exhibit at Chicago will be the Automatic Transfer Type Crankpin Grinding Machine. This Norton-engineered advancement grinds pins on automotive type crankshafts completely automatically — eliminating entirely the manual operations of loading, clamping, adjusting, controlling size, gaging and unloading. Savings of time and labor are thus built up for every pin on the shaft.

Movements of the transfer mechanism are electrically controlled, hydraulically operated and completely interlocked to control proper operating sequence.

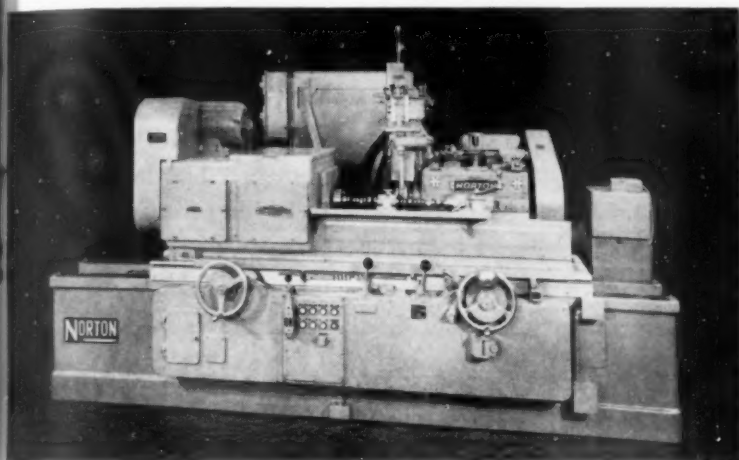
Other Norton automated grinders are on the way. Meet competition with the most economical modernization of grinding methods now available. Norton engineers will gladly discuss complete or partial automation of your grinding operations



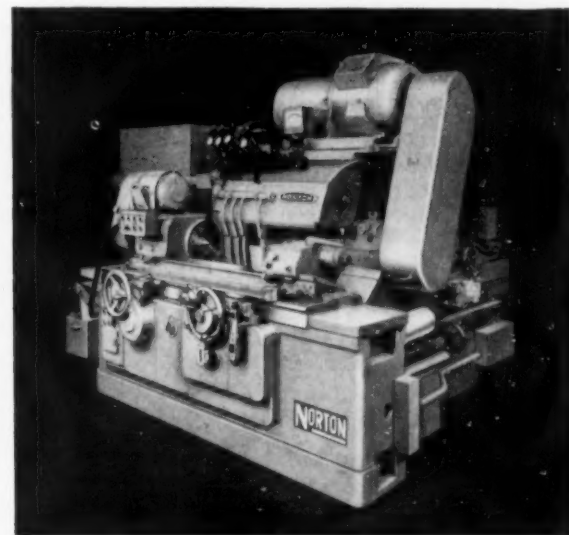
SEMIAUTOMATIC ANGULAR WHEELSLIDE GRINDER — TYPE CV-4. Grinds thrust surfaces and adjacent diameters in one fast automatic plunge grind operation. Eliminates the separate grinds necessary with conventional machines. Operator merely loads, starts automatic cycle, and unloads. Work lengths: 18", 36", 48", 72".



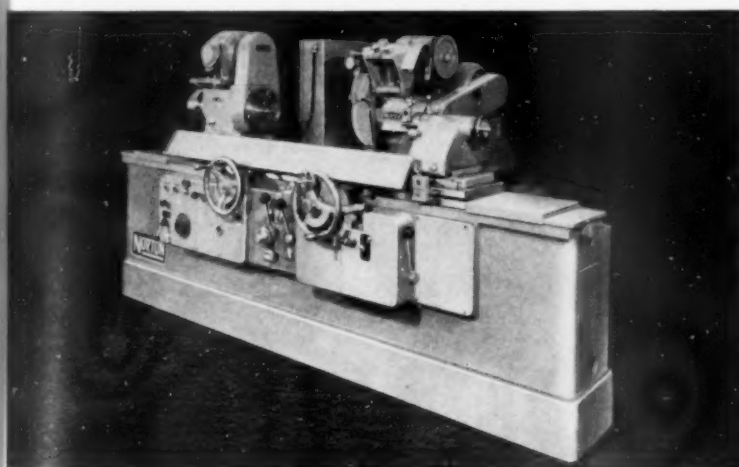
HYPROLAP* HIGH PRODUCTION LAPPING MACHINE NO. 48F. For extremely fast, high production of single or parallel face flat lapping. Bonded abrasive laps produce work pieces free of grit. Arrangements: plain, time cycle . . . automatic continuous feed . . . semiautomatic continuous feed.



CAM-O-MATIC* CAM GRINDER NO. 3. A new, highly advanced automatic machine that sets new standards for production, precision and finish. Solid construction cuts vibration, assures maximum accuracy and service life. Entire operating cycle is geared to split-second efficiency. Capacity for taper-face grinding gives added versatility.



HEAVY DUTY MULTI-WHEEL GRINDER — TYPE CM-1. Makes four or more cuts simultaneously in a single plunge-grind cycle. Operates automatically, under one-lever control. Brings new economy to the grinding of multi-diameter parts such as crank and camshafts, etc. In 10" x 30" and 14" x 30" sizes.



12" UNIVERSAL GRINDER — TYPE U-4. Quick, easy set-ups plus fast grinding action over a wide variety of external, internal, face and angular wheelslide grinding jobs. Permanent chuck mounting is one of many advanced features. Work lengths: 36" and 48".

Also shown at Chicago will be the Norton 10" Semiautomatic Cylindrical Grinder — Type CTU. Designed for plunge or traverse type operations, from rough cuts to finest finishing. Production and job shop users report one Type CTU replaces several other machines.

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Cleveland 8, Ohio

Detroit Office: General Motors Building

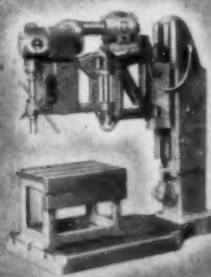
1, 2, 3, 4 and
6 Spindle
Sensitive
Drilling
Machines



Extremely Accurate Hammond
Tool Room Grinder



Unique Bracket Type Hammond
Radial Drilling and Tapping Machine



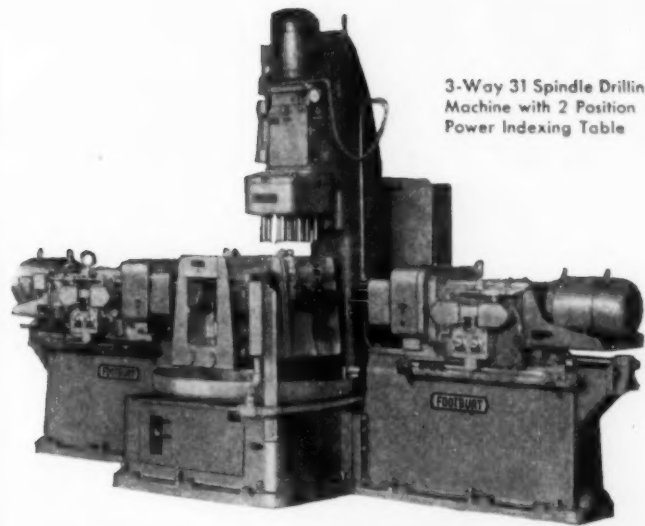
Continuous Type Broaching
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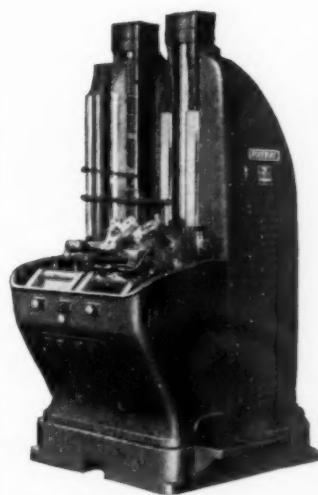
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M A C H I N E T O O L S

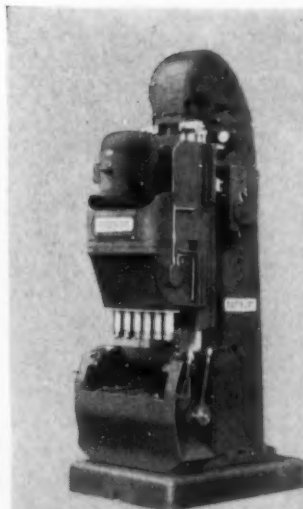
al Production...



3-Way 31 Spindle Drilling Machine with 2 Position Power Indexing Table



Duplex Surface Broaching Machine
5, 10, 15 and 25 ton capacity



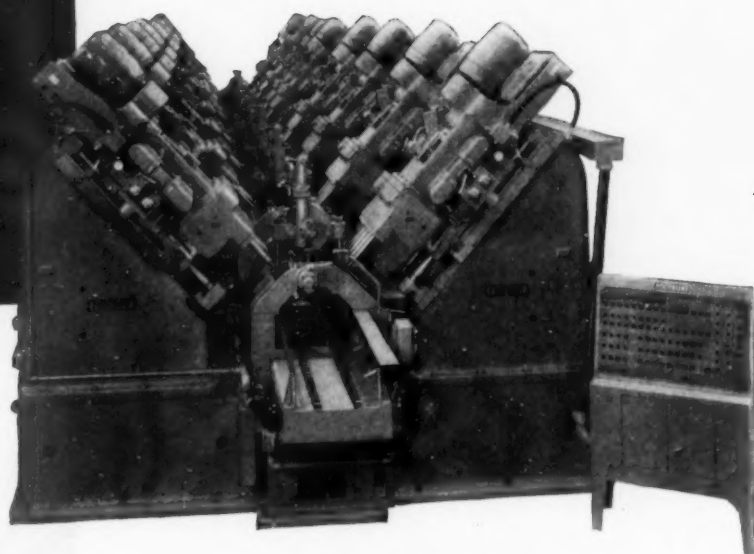
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Single Slide Broaching Machine,
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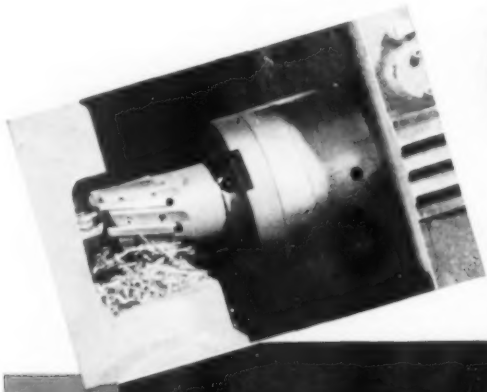


17 Station, 80 Spindle Drilling Machine

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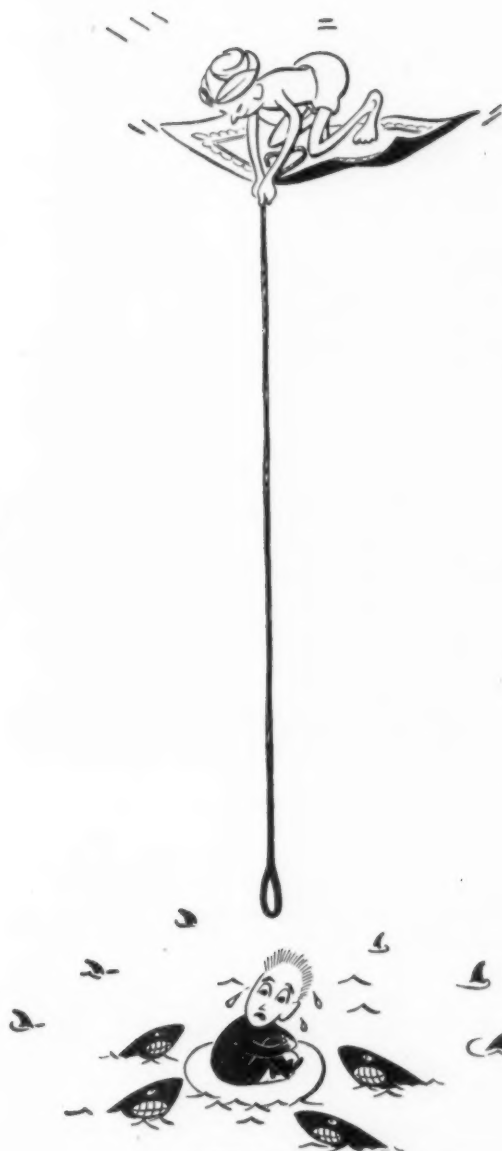
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ROCKFORD, ILLINOIS, U. S. A.

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ORIGINATORS OF *SHEAR
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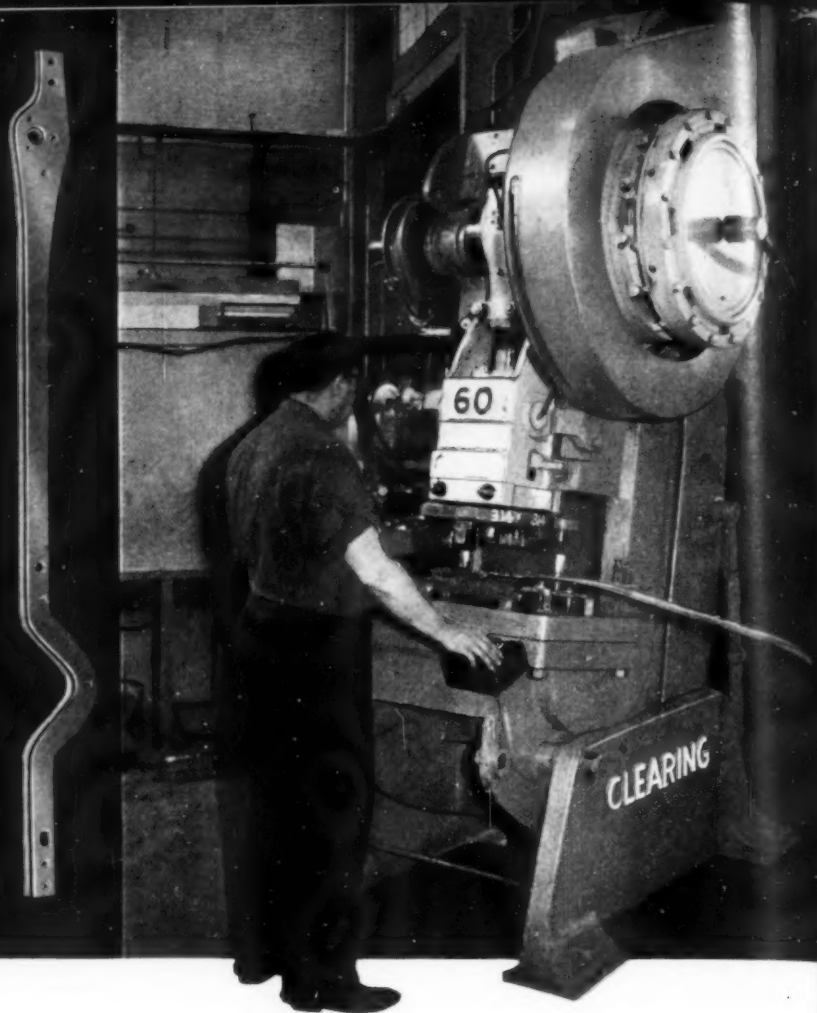
FOR THE FINEST IN
CUTTING TOOLS AND GAGES



Made by **THREADWELL**, Greenfield, Mass.



Frame sections for the model are formed in this 75 ton Clearing O.B.I.



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The Tool Engineer

Who Gets the Credit?

Labor has again demanded and been guaranteed its pound of flesh from the steel companies. This starts the vicious circle again because the steel companies simply slice it off their customers. But steel customers are product suppliers and they must accumulate their share of steel labor's pound, plus any rise in their own labor costs, from buyers of their products. And yet, when prices of things that labor buys go up, they (and sometimes the rest of us) wonder why.

Union officials, in their story to the public, pointed out that more steel was produced this year than last and with fewer employees; therefore, those who produced the steel should receive a bigger "share" for their endeavor. Similarly, more automobiles, more refrigerators and more everything else was produced per employee than in past years. Yes, productivity is going up and, fortunately, so fast in some areas that prices have actually come down—the price of a 21-inch TV set today is less than the 10-inch set of years gone by.

But who gets the credit?

Not one single individual has had to work harder or longer to make all this possible. In fact, more plant workers are actually expending less physical energy. They simply have been given better equipment with which to work.

Let's give American industry credit for having the courage and faith in the future of America to invest billions (out of profits after taxes) in new facilities.

Let's give credit to the American scientists and engineers who conceive and develop our manufacturing technology, and to engineers—the tool engineers—who put it to work to produce more and more goods for more people at less cost. It is thus we maintain our high standard of living—the envy of all the other nations of the world.

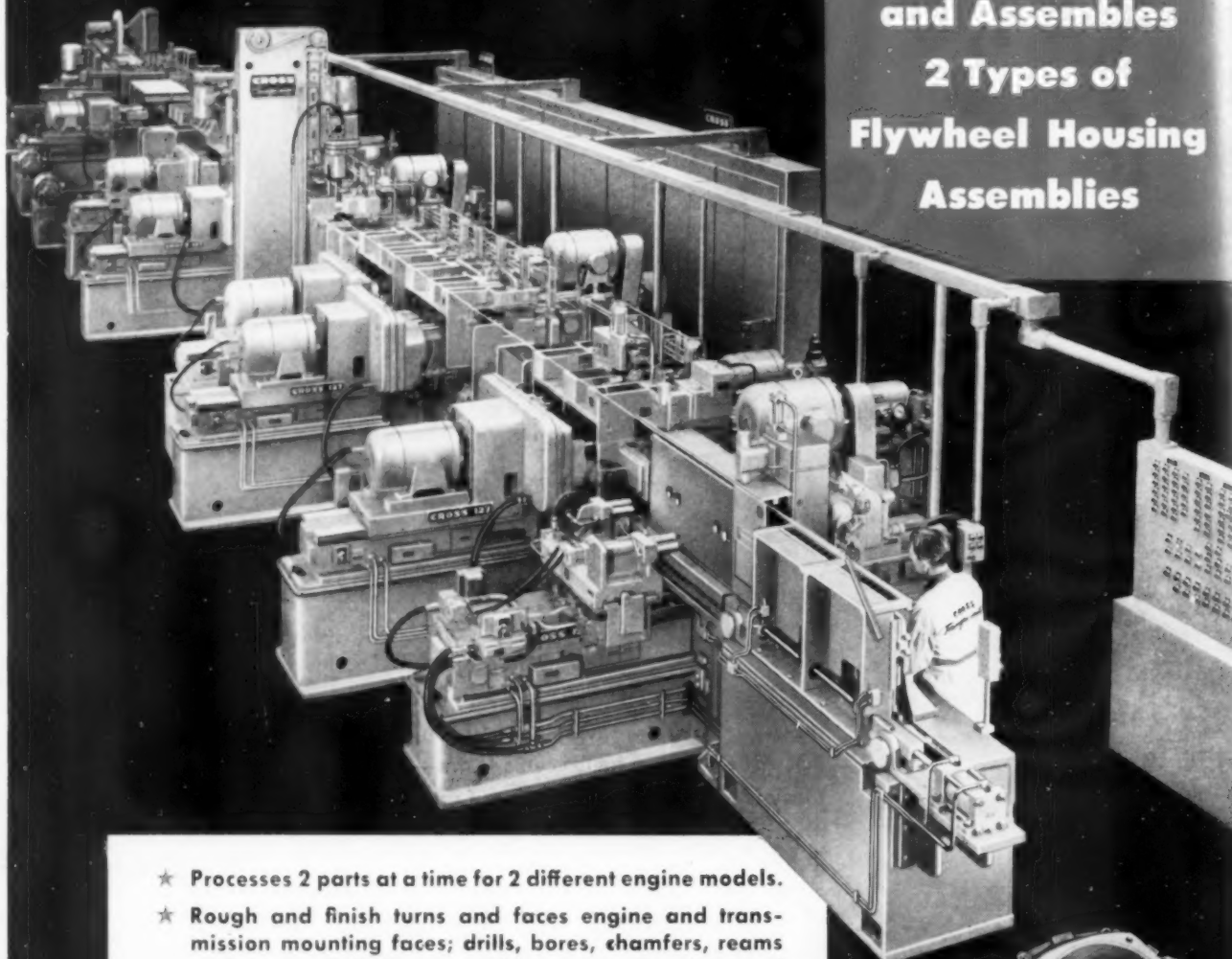
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PRESIDENT
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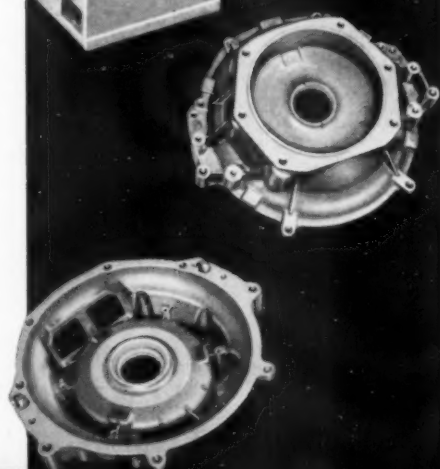


Another Transfer-matic by Cross

**Bores, Faces, Drills
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- ★ 314 pieces per hour at 100% efficiency.
- ★ 20 stations: 1 loading; 10 machining; 2 assembling; 4 inspecting; 2 cleaning; 1 unloading.
- ★ Pre-set tools to reduce downtime for tool changing.
- ★ Complete interchangeability of all standard and special parts for easy maintenance.
- ★ Other features: Construction to J.I.C. standards; hydraulic feed and rapid traverse; hardened and ground ways; automatic lubrication.



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Special MACHINE TOOLS

DEVELOPMENTS AND ACHIEVEMENTS

in machine tool processes

Recent advances in the basic machine tool processes provide for increased production through higher capacity, more precision and automatic controls in machines, both large and small. These are discussed in the following articles written by outstanding authorities. Many of the design features discussed will be seen at the National Machine Tool Show in Chicago, September 6-17. Typical machines to be exhibited are described in the "Tools of Today" section in this issue.

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MILLING

*variable-speed drives
and tracer controls improve utility*

LIKE OTHER METALWORKING operations, milling is a link in a competitive economy. It has to hold its own against rival methods. In certain fields it competes with planing and shaping. In others it competes with broaching and grinding, or with various thread-cutting operations. Its competitive position is ever changing.

Many planing jobs have been replaced profitably by milling but, when carbide-tipped tools of sufficient toughness became available, the high-speed planer recaptured at least a part of its lost area. On the other hand, large planer-type milling machines, Fig. 1, equipped with carbide-tipped face

By Erik K. Henriksen*
University of Missouri
Columbia, Mo.

milling cutters (and with negative rake or double rake inserts for milling steel) are now again in successful competition with the conventional and the heavy-duty high-speed planer.

In lieu of a detailed estimate, the following criterion, widely used in shops across the country, may be helpful in deciding between milling and planing-shaping: Milling is the more profitable process if total time is less than 40 percent of the time for the same job on a planer or a shaper.

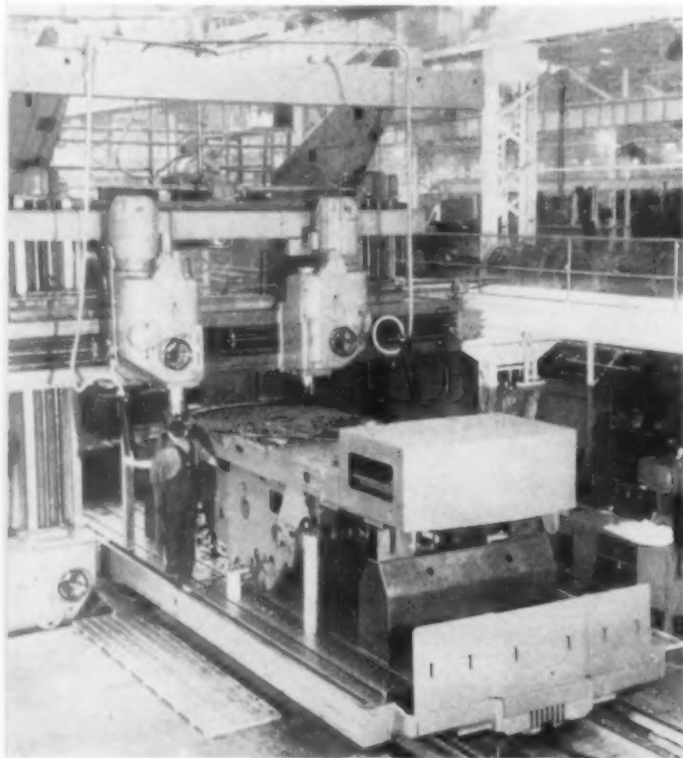
Large broaching machines have replaced milling machines in the automotive field, at least temporarily. When cutting a relatively soft material such as cast iron and with moderate machining allowances, the feed becomes the significant factor. Multiple-head milling machines with feeds well above 100 ipm are again in use for machining the flat surfaces on cylinder blocks and heads.

In comparing the possible technical and economical advantages of milling with those of other machining methods, the following factors are usually considered:

1. Rate of metal removal
2. Accuracy and quality of finished surface
3. Possibility of forming and generating combined or complex surfaces
4. Adaptability and versatility of equipment
5. Labor saving through sequence control and automation
6. Cost of tooling.

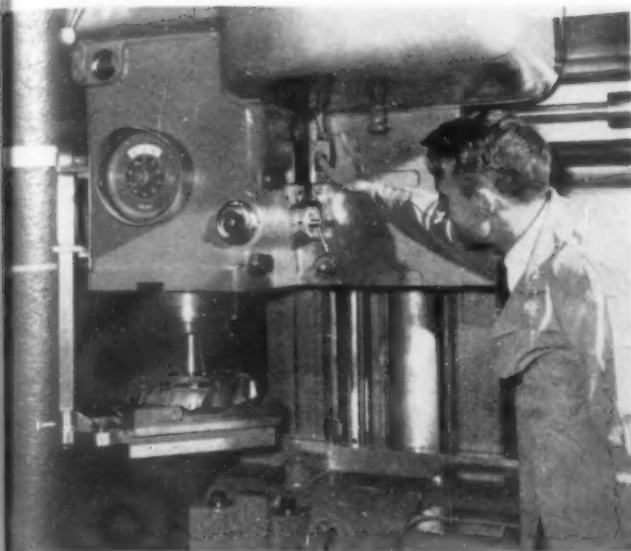
Characteristics of Milling: The milling cutter, being a multiple-point tool, has a rate of metal removal that is usually much higher than that of

* ASTE member at large.



—Photo, courtesy Giddings and Lewis Machine Tool Co.

Fig. 1. Planer type milling machines, competing successfully with large, heavy-duty high-speed planers.



—Photo, courtesy The G. A. Gray Co.

Fig. 2. Cutter carrier "Sky hook" in the process of positioning a large face milling cutter in milling machine spindle.

a single-point tool, especially when the tool is backed up by sufficient driving power.

The introduction of carbide tooling for milling machines disclosed the inadequacy in horsepower of many existing machines and inspired manufacturers to increase milling machine horsepower. Vertical milling machines are now common with 50 to 100-hp drives. The lower power range is for moderate speed; the upper is for high cutting speeds with carbide tipped cutters. Automatic power control and high rigidity are incorporated in the design of the machine and constitute important factors for achievement of high accuracy, fine finish and satisfactory tool life.

One factor in rigidity involves providing adequate support in the guides for moving parts. With some high-capacity machines the dovetail guides have been replaced by rectangular guides provid-

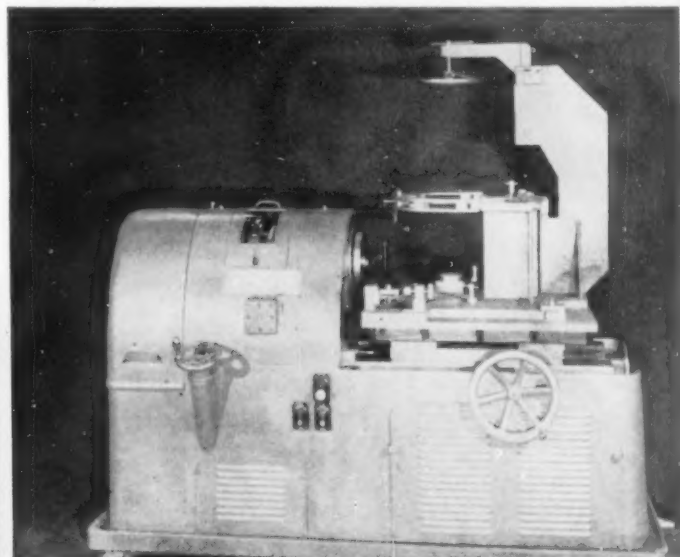
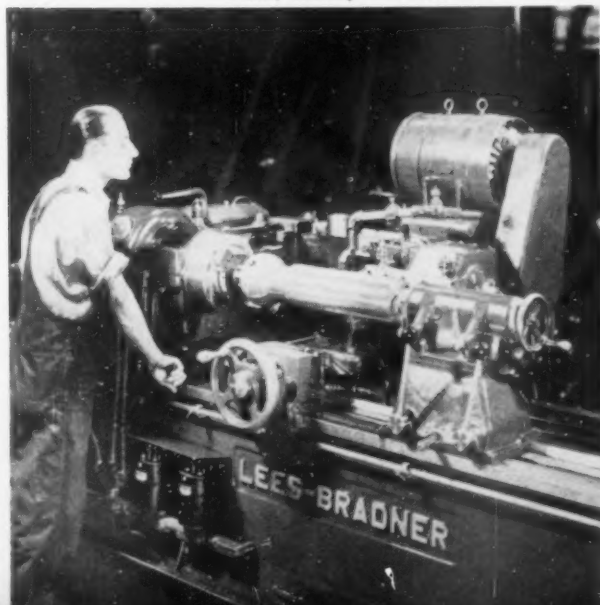
ing larger bearing areas with less binding tendency. Full advantage of the high rate of metal removal is only possible when manual operations in the control of the machine are simplified and reduced to a minimum. Automatic table cycles, changing the table motion for feed, rapid traverse and rapid return are obtained by means of adjustable dogs on the table. Manual control of all other table movements is greatly simplified and accelerated by a single lever control. The setting of the spindle to proper height is facilitated by the addition of the four-position turret-stop.

Time and work-saving devices have been developed for the handling of the large and heavy cutters required for these machines. Small jib cranes with cutter carriers, *Fig. 2*, bring the cutter into position on the spindle in a matter of a few minutes.

Milling distinguishes itself from every other metal-cutting operation by its comma-shaped chip. The thickness of the layer to be machined is practically independent of the cutter and, to some extent, independent of the machine itself. This makes milling a roughing operation for high rate of metal removal. Simultaneously, however, it is an excellent finishing operation, because the chip thickness tapers to zero at the finished surface.

Advantages of this important feature are further augmented where work and tool are given an additional relative motion as in the generating of gear teeth and screw threads. Milling is usually superior to other threading operations when high accuracy and fine finish are required on work in

—Photo, courtesy The Lees-Bradner Co.



—Courtesy The Sheffield Corp. Murchey Div.

Fig. 3. (left) Thread miller with work on centers.

Fig. 4. (above) Planetary type thread miller with work fixture.

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large quantities, particularly on alloy or high-carbon steel.

Thread milling machines are either cross-slide or planetary type. The cross-slide type can have the cutter on the cross-slide and the work in the headstock or between centers, *Fig. 3*. For multiple-start threads, machines have an indexing device. For taper threads, they are equipped with a taper attachment, as on a lathe. They can also be provided with a plain lathe tool-post for facing and turning in the same setting as the threading.

The planetary type has the planetary cutter spindle in the headstock. Work may be held by conventional means or in special fixtures, *Fig. 4*. A useful feature is the simultaneous milling of external and internal threads by two planetary cutters.

—Photo, courtesy Brown & Sharpe Mfg. Co.

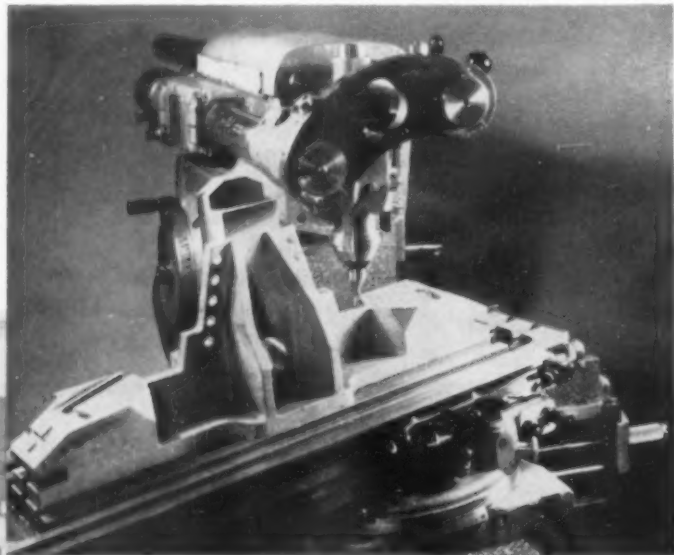


Fig. 5. (above) Universal milling machine with vertical milling attachment.

Fig. 6. (right) Milling machine, with tilting spindle and turret, permits the setting of spindle to any angle with work.

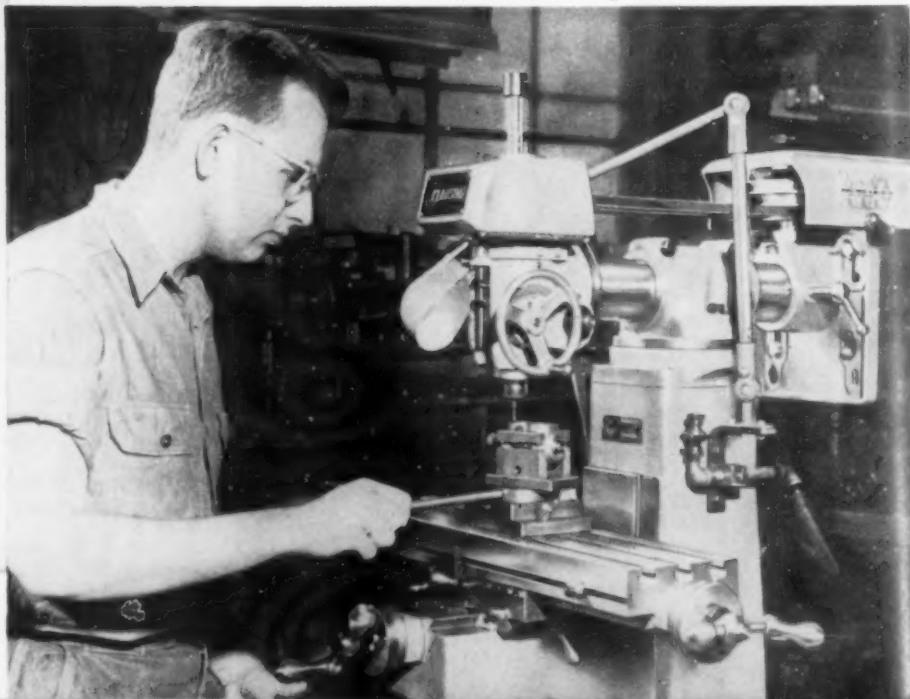
Universal Machines: Entirely different types of complicated surfaces are encountered in the toolroom, calling for the "old faithful" universal milling machine with its well-known dividing head. Its versatility is further expanded by vertical milling attachments, *Fig. 5*, single and double universal milling attachments, rack-cutting attachments and power-driven rotary tables. With a vertical slotting attachment the milling machine enters a field otherwise occupied by the broaching machine, but on a more economical basis for small-quantity production.

Increased demands for versatility in the machining of compound angles have led to the construction of the tilting spindle milling machine. Recent developments have resulted in machines with a variety of features. The machine shown in *Fig. 6* has versatile features by which the ram can rotate around a vertical axis, and its tilting spindle can make any angle with the workpiece mounted on the table. A depth vernier for cutter setting, and spindle brake for instantaneous stop are additional features for reducing manual motions in operating the machine.

A radically different construction is shown in *Fig. 7*. This machine has tilting spindle and tilting table. It is a heavy-duty ram type machine, with motor horsepower up to 25 and with a wide range of power feeds, including rapid traverse. Table feed varies from 0.250 to 100 ipm; vertical feed from 0.070 to 38 with 100 ipm rapid traverse. Feeds are operated by a 3-hp electronically controlled motor.

Tracing Machines: Irregular shapes require copying or tracing from a master. Machines for direct tracing by contact are either duplicator or pantograph machines. The difference is that the

—Photo, courtesy Clausing Division, Atlas Press Co.



duplicator requires a master, in true size, while the pantograph permits the use of a master made to a different scale. Each of these machines can be used for two-dimensional or three-dimensional shapes. Reduction in labor is effected by high-speed operation of cutters and by partly or fully automatic operation, frequently in combination with multiple-spindle units.

Semicircular shapes, which often occur in dies, are produced by machines with oscillating heads. The head of the machine is mounted on two large eccentrics with adjustable strokes, either hand or power operated. The purpose of this device is to generate semicylindrical cavities, as the table is fed forward. When equipped with a rotary table, it is possible to generate hemispherical cavities without difficulty.

Cavities and projections of almost any form can be produced on Keller machines, Fig. 8. The tracer follows the master. Four electrical contacts, arranged 90 deg apart, are operated by the pressure between tracer and master. A light pressure breaks one contact, slightly increased pressure closes the opposite contact. A motion of 0.001 inch is suf-

milling

ficient for a complete reversal of travel. The contacts work through relays and ultimately control magnetic clutches in the leadscrew drives. The four-contact system is used for 2-dimensional work. A tracer for 3-dimensional work is also available.

The Keller machine is equally well suited for machining single pieces, like dies and molds, and for quantity production of complicated shapes. Several spindles can be controlled from one tracer. Also, a left-hand workpiece can be produced from a right-hand master. The machine embodies various interesting details, such as phenolic liners on slides, and a device for knocking out the cutter.

Probably the basic element in automatic tracer-controlled milling machines is the hydraulic tracer. Schematically this mechanism is shown in Fig. 9. It consists of a rise-and-fall cylinder with a piston, a tracer finger, connected with a spring-loaded inner valve body, located inside a valve housing with inlet and exhaust ports in its walls. The ports

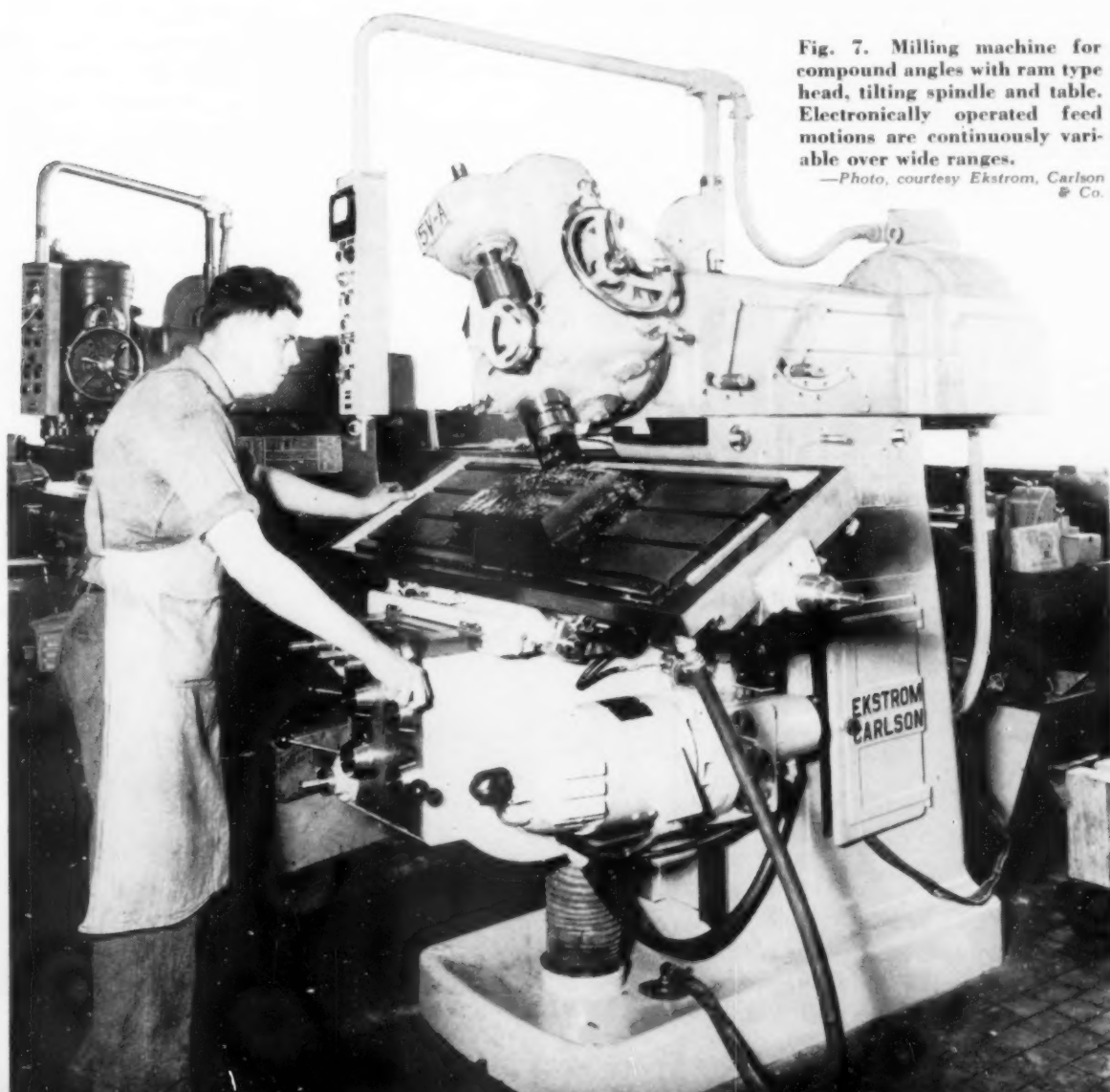
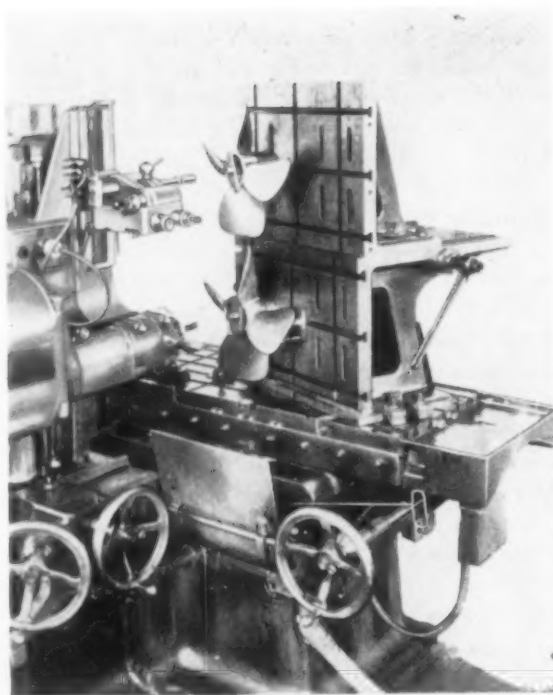


Fig. 7. Milling machine for compound angles with ram type head, tilting spindle and table. Electronically operated feed motions are continuously variable over wide ranges.

—Photo, courtesy Ekstrom, Carlson & Co.

MACHINE TOOL PROCESSES

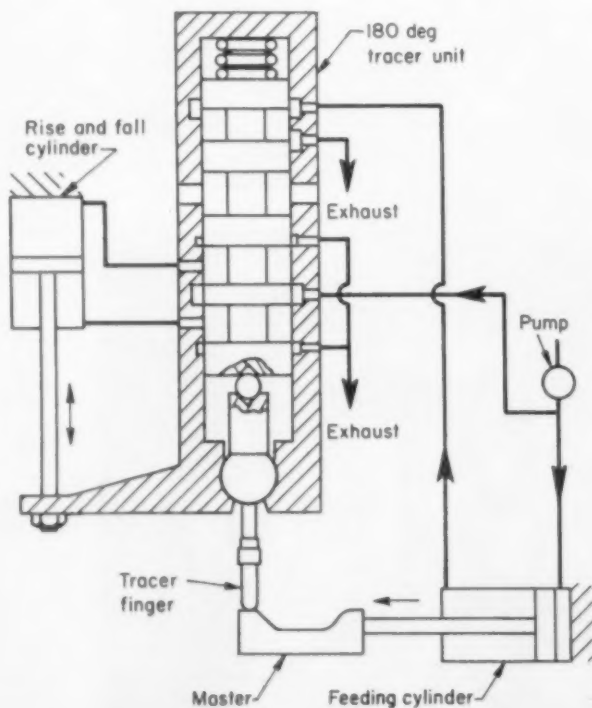


—Photo, courtesy Pratt & Whitney.

Fig. 8. Keller machine machining a propeller forging. A completed propeller acts as master.

Fig. 9. Schematic arrangement of hydraulic 180 deg. or depth control tracer.

—Courtesy Cincinnati Milling Machine Co.



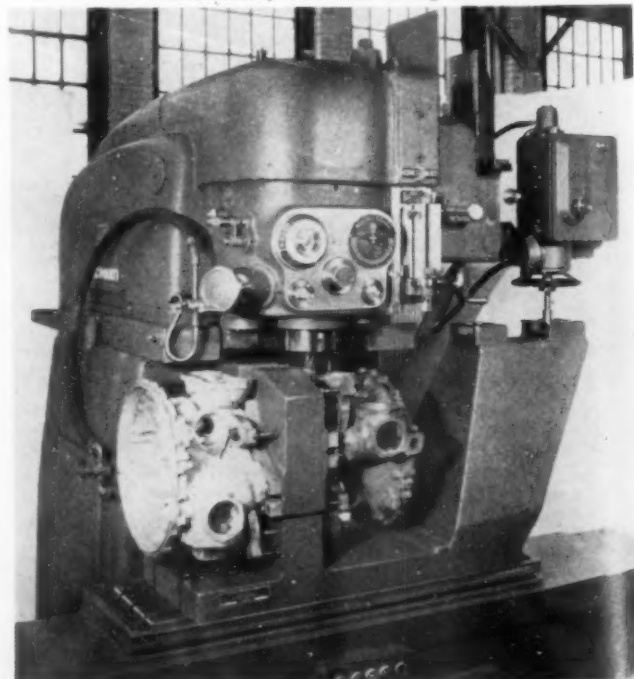
are connected with the cylinder below and above the piston. Other connections supply oil from the pump and provide for exhaust. The valve body is slidable up and down in rigid connection with the piston in the cylinder.

When master and work moves horizontally the tracer finger will follow the contour of the master. If, for example, the finger moves down, one set of exhaust ports will open and oil will flow away from the lower part of the cylinder. The oil pressure will be on the upper side of the piston. Consequently, the piston will move down, together with the whole housing. This process will continue until the exhaust valves are closed again and equilibrium is re-established. The result is that the complete tracer unit will hunt up and down, following the tracer finger, which in turn follows the master contour. The cutter head is connected to the tracer unit so as to follow it. Sensitivity of the mechanism is high enough to ensure a duplication accuracy of ± 0.003 inches or better, depending upon feed rate and path slope over the master.

Usually the tracer unit is disengaged during rapid return. It can, however, remain engaged so that the cutter head feeds down and approaches the starting position automatically, thereby saving time. On three-dimensional masters, the tracer will reciprocate over the master, scanning a rectangular area. The application of a "short-stroke button" enables the operator to save time in traversing ineffective areas.

Fig. 10. Typical application of 360-degree contour tracer on aircraft engine wheelcase. Machine is fully controlled by tracer, ordinary mechanical hand and power feed controls are absent.

—Photo, courtesy Cincinnati Milling Machine Co.



The tracer system described is for a contour not exceeding 180 deg. By further additions, 360-deg contours can be machined continuously. An example is shown in Fig. 10. With this mechanism, all movements are controlled automatically and solely by the tracer mechanism, resulting in simplification of the machine through elimination of manual feed mechanisms.

Other tracer-controlled machines have the additional feature of a variable-feed attachment, consisting of a cam shaped in accordance with variations in the width of the surface to be machined. The cam controls the hydraulic feed-rate selector so that the feed rate is increased over narrower widths and decreased over larger widths, resulting in constant maximum metal removal rate.

Profile Machines: In the aircraft industry, a highly adaptable machine of large dimensions, the airframe profile milling machine is essentially a planer type milling machine. It has rates of feed probably unsurpassed by any other milling machine. Feeds up to 320 ipm remove metal at adequate rates from workpieces of aluminum and other light metals. Feeds are by leadscrews, actuated by hydraulic motors and are infinitely variable. Table is mounted on special crossed-axis roller bearings to compensate for vertical as well as side thrust loads.

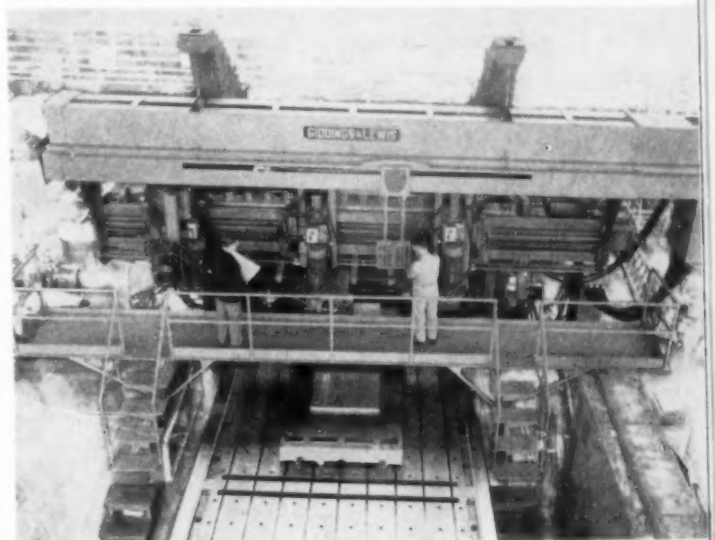
Unusual operations in the aircraft industry involve skin milling and spar milling. The skin milling machine produces a skin with integral stiffening ribs from a heavy plate. Many obstacles, such as the control of residual stresses in the material, had to be overcome before the method was successful. Today's skin milling machine is either of the sliding table type or of the gantry type.

A sliding table type machine, Fig. 11, is 30 feet wide by 80 feet long and weighs 200 tons. It employs three milling heads, each with a 100-hp water-cooled motor, capable of spindle speeds of 3600 rpm, and 7200 rpm, infinitely variable down to 1200 and 2400 rpm, respectively. The maximum rate of metal removal is 600 cubic inches per minute and conveyor belts are installed for the removal of chips. Side and end mills are used, as the shape of the job requires. Cutter setting is controlled by hydraulic tracers, thereby enable the machine to produce straight, tapered and curved skin elements. Work is held by vacuum chucks built into the worktable, and the finished work is removed with the aid of pneumatic lifters. The machine requires two operators, placed on a bridge directly above the cutter positions.

The gantry type machine has a fixed bed for the work, and the cutter heads are mounted on a traveling frame. The total length of the machine can thus be utilized for work, and a saving in floorspace is accomplished.

milling

The spar milling machine is likewise built in these two types. Speeds, feeds and motor power are of the same order as skin milling machines, viz. up to 100 hp on a single spindle and up to 300 ipm feed with 400-ipm rapid traverse. Since the shapes of spars may be more complicated than skins, there are additional features embodied in these machines, such as tilting and swivelling cutter heads, Fig. 12, capable of moving 45 deg from the



—Photo, courtesy Giddings and Lewis Machine Tool Co.

Fig. 11. Skin milling machine, showing operator's bridge, control station and cutter heads with motors. It is capable of removing metal at a rate of 600 cubic inches per minute.

horizontal and vertical. Also, twisted shapes can be produced by utilizing a tracer twist movement of ± 25 deg. Accuracy on these machines is 0.001 inch or better.

An electronic airfoil milling machine produces airfoil shapes such as used in turbo jets. The produced blades can be straight or twisted, but they are each produced from a small number, sometimes only three, of flat master templates for reference sections. The machine is built essentially as a lathe, with a headstock in the middle and one tailstock at each end. One half of the machine is for the master, the other half is for the work. A cutter head moves on a carriage past the work.

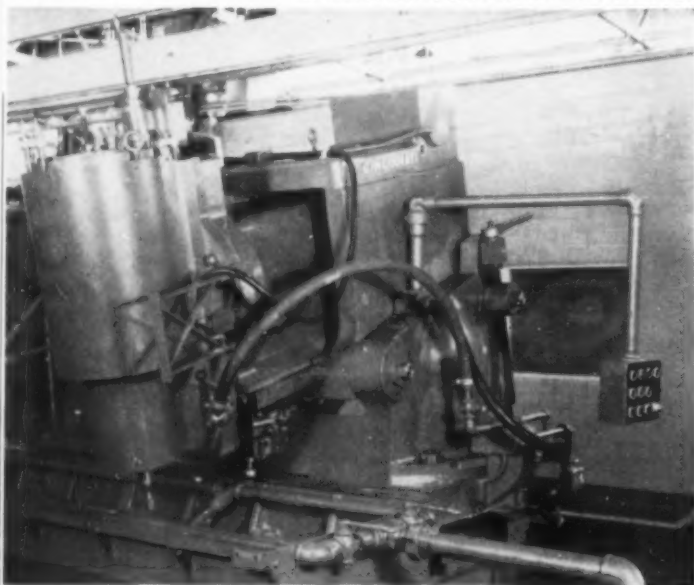
The tracing system is shown in Fig. 13. In this machine (discussed in *THE TOOL ENGINEER*, June 1954, page 46) four individual sectional templates rotate, moving bars back and forth. The extreme ends of the bars control the shape of a flexible strip which adheres to the end of the bars by magnetism; thus the initial shape of strip represents the longi-

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tudinal shape of the airfoil, except for twist. The longitudinal shape is picked up by a tracer which transfers it to the cutter. Simultaneously, the twist is represented by another flexible strip and is picked up by a second tracer and transferred, through a differential, to the spindle rotation. Tracers are of a noncontacting electronic type that maintains a spark gap of 0.001 inch between tracer and strip.

Features for Standard Machines: Automatic operation does not necessarily require special machines. It is frequently possible to convert a standard machine to automatic operation by the use of

—Photo, courtesy Cincinnati Milling Machine Co.



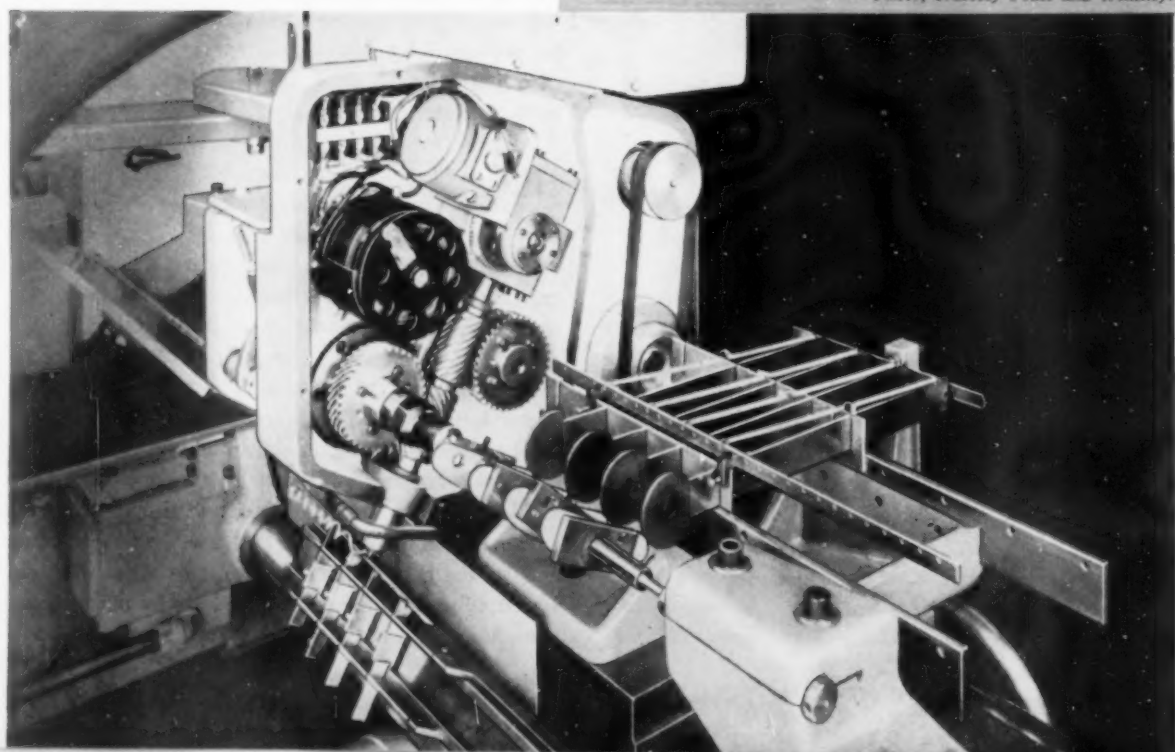
additional equipment. Fig. 14 shows a standard plain milling machine set up for milling flutes in four reamers simultaneously. The special equipment consists of a motor-operated four-spindle automatic-indexing fixture mounted on a cam-operated tilting table. The fixture has a self-contained set of three index plates for 4, 5 or 6 flutes. Any one of these plates can be used. The operator removes a cover plate, releases a setscrew, then moves the desired plate to the operating position and retightens the setscrew. The workpieces are held between the fixture headstock and footstock.

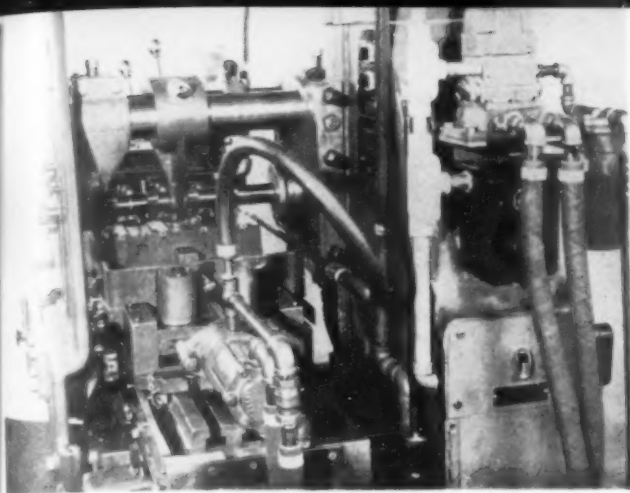
The table advances at the fast traverse rate to a position where it automatically changes to the predetermined feed rate. At this point, the work is raised to the cutting position and the center rests are clamped by an air-operated mechanism. The table continues to move at the feed rate through the milling cut until a table dog causes the table to reverse direction at the fast traverse rates. At the same time, the dog operates the table mechanism to lower the work to clear the cutters and release the center rests. The table return movement continues until another dog changes the table direction and the cycle is repeated. Indexing to the next cut occurs during the table return movement after the work is clear of the cutter. When the final milling cut has been made, a fixture switch operates to make the table stop in the loading position.

Fig. 12. (left) Cutter head for gantry type spar milling machine shown in tilted position. Angular adjustment is available in all three planes.

Fig. 13. (below) Master template section of Electronic airfoil milling machine, showing master templates, interpolating mechanism and tracers.

—Photo, courtesy Pratt and Whitney.





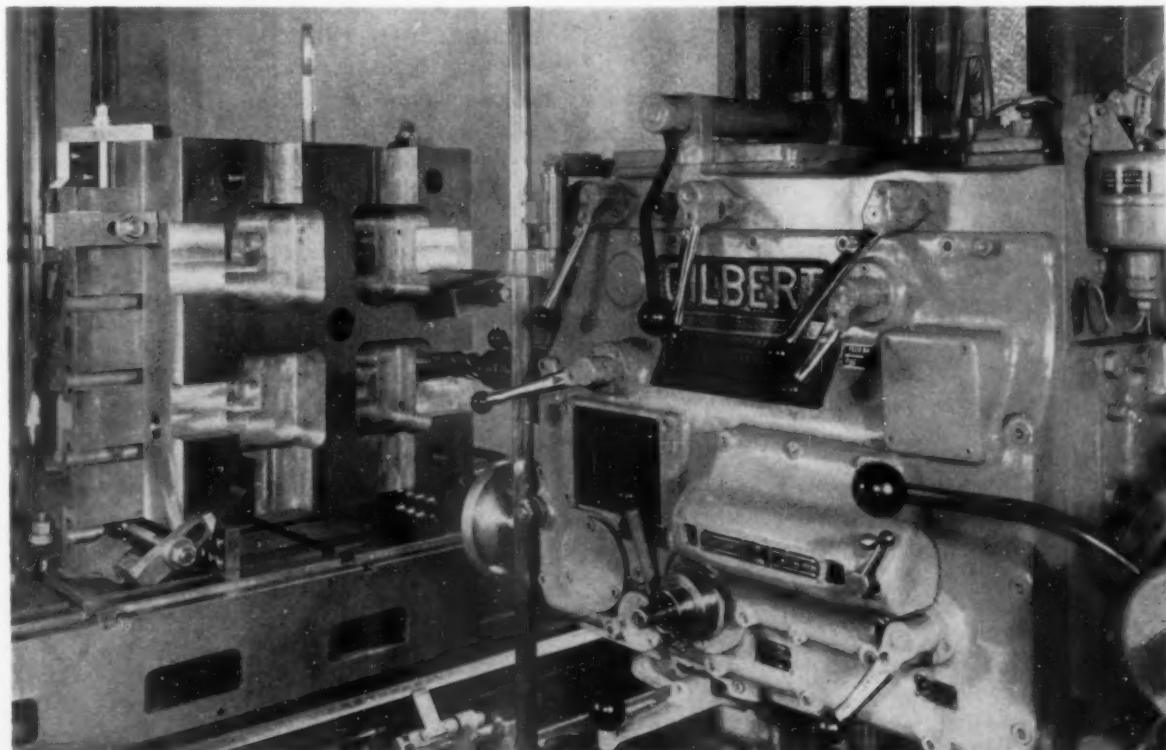
—Photo, courtesy Brown & Sharpe Mfg. Co.

Fig. 14. Standard milling machine with special tooling for automatic operation. Operator loads and unloads, and can take care of several machines.

Plain milling machines for small work are available in a variety of models and sizes. Some are really "little brothers" to the conventional heavy-duty plain milling machine. Some have multiple spindles with cam-controlled rise-and-fall motion of the cutter head. Still smaller horizontal or vertical machines, usually bench models, are entirely hand fed.

At the other extreme, there is a machine of almost unlimited versatility for medium and large work: the horizontal boring and milling machine. This machine is made in table types for the smaller sizes and in floor types for the larger sizes. Built

Fig. 15. Floor type horizontal boring and milling machine with revolving column. It is particularly suitable for large size die work.



—Photo, courtesy The Cincinnati Gilbert Machine Tool Co.

milling

for the dual purpose of boring and milling, they perform almost any metal-removing operation with the exception of grinding and gear tooth generating. Heavy and rigid spindles range from 3 to 8 inches in diameter and are excellent for milling heavy work. Rigidity and high quality workmanship make these machines the equivalent of jig borers. Their versatility, in particular the floor type with revolving column, Fig. 15, makes them unsurpassed for many intricate jobs in die machining. Their versatility for milling operations is further augmented by numerous attachments. The machine is flexible in its operation, in that it is less fixed in over-all dimensions than most other machine tools. Table and floor plan sizes can be selected to suit the job within wide limits.

Since the introduction of climb milling and the backlash eliminator about 25 years ago there has been no radical change in the design of milling machines, but the development has been one of step-by-step evolution. A revolution may, however, be forthcoming in a not too distant future when ceramic cutters become a practical production tool. Then a milling cutter will be a mixture of a grinding wheel and a conventional cutter. Milling machines will borrow constructional details from grinders. The result will be machines that are entirely different from present milling machines in performance and appearance.

BROACHING

*process with operational simplicity,
high production and adaptability for automation*

By Joseph P. Crosby*

Vice President
The Lapointe Machine Tool Co.
Hudson, Mass.

BROACHING, newest of the basic methods of cutting metal, is capable of achieving results otherwise requiring a combination of other machining processing such as turning, milling, shaping, hobbing, boring and grinding. This ability to simplify operations is its most outstanding feature and is perhaps the chief factor in the increasing use of the broaching process in plants, both large and small, throughout the world.

In this age of production, machines not only

*Senior member ASTE Boston chapter.

must be capable of increased operating speed but also should increase the productivity of each man-hour of labor. These two goals are not necessarily synonymous even though increased operating speed obviously increases production. By combining in one pass of a broaching tool several operations, production is multiplied.

In the mass production field broaching has been made a continuous automatic process. Broaching machines, as exemplified in *Figs. 1 and 2*, are designed for high output and lend themselves to use on automation lines. Often, when full automation is not possible, the use of a hopper feed will materially conserve manpower. Where manual loading is required, the production of a continuous broaching machine is limited only by the rate at which the machine can be loaded by the operator. Unloading is automatic, *Fig. 3*.

The foregoing illustrations indicate the possibilities of continuous machines. Broaching of these automotive connecting rods is performed at the rate of 1200 parts per hour. This production is achieved through the use of multiple fixtures in the machine, moving on a heavy twin-chain, and carrying the parts past the broach.

Previously, development of vertical broaching machines with double rams made possible a substantial increase in production because one ram can be cutting while the operator is unloading and loading the other ram. Recent developments of double-ram broaching include not only the repetitive cutting of a single form on both rams but also the broaching of different forms on each of the

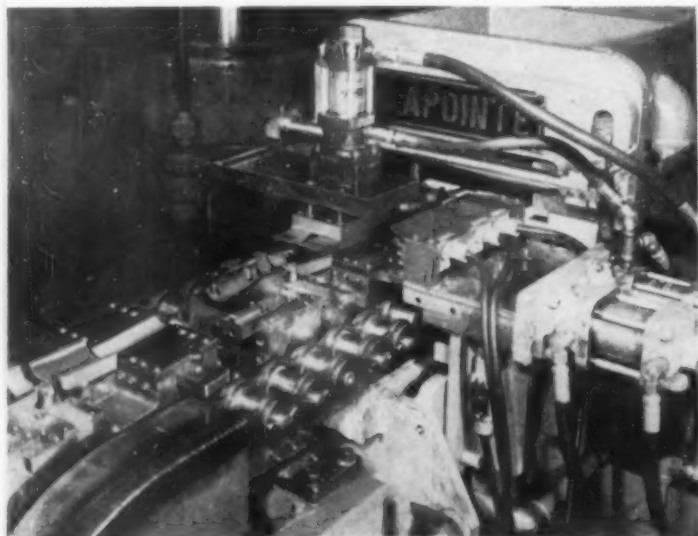


Fig. 1. Loading end of continuous machine for broaching connecting rods. Twenty fixtures hold workpieces by pneumatic seating clamps.

rams, so that a single operator can carry the part that much farther toward completion. In some instances multiple fixtures are used on a self-indexing principle which still further increases the rate of production.

Such an operation is shown in *Fig. 4*, where a double ram vertical broaching machine has one ram tooled to broach the periphery slot in a jet turbine wheel and the other ram tooled to broach jet buckets. The wheel is indexed automatically and the buckets for each wheel are finished simultaneously. *Fig. 5* shows details of the work-holding fixtures and index mechanism of this machine.

Along with an advantage in production rate, broaching offers repetitive accuracy even on difficult shapes, with tolerances ranging down to micro-inches. This feature of broaching makes it possible to produce intricately designed interchangeable parts at production rates demanded by today's economy. Broaching has not only served this country well in its emergency needs for defense production but it is serving civilian needs by helping to hold down prices of finished products, the best known of which, perhaps, is the automobile.

Surprisingly, broaching in its modern concept is only 53 years old. For this reason it is perhaps to be expected that every year should bring to light new engineering possibilities for further developments in broaching. Indeed many of the current accomplishments were not considered practicable as recently as three or four years ago. Because of the rapid developments in this field many production-minded executives are carefully following reports of progress in specific applications.

One of the major developments in the past year in the broaching industry is the use of electro-motive power. The smooth-powered mechanical drive allows cutting speeds up to 300 fpm. This has

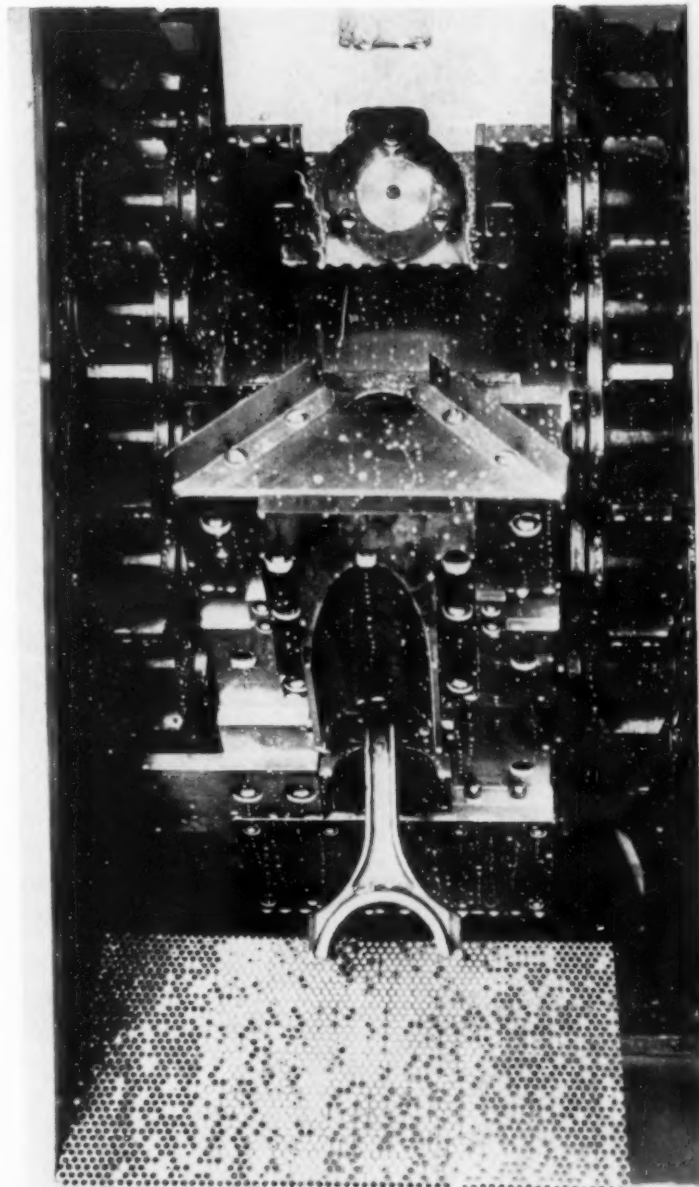
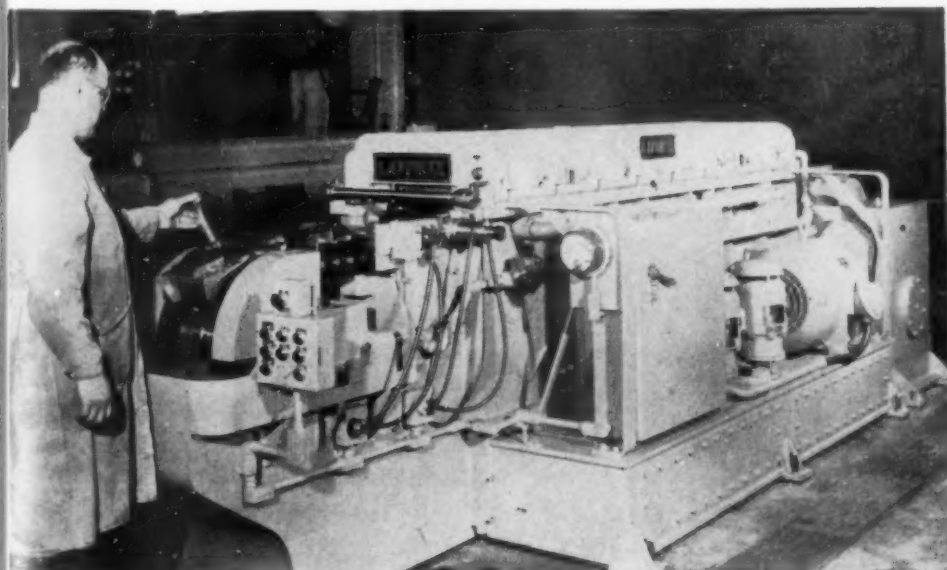


Fig. 2. (left) Over-all view of continuous broaching machine showing manual loading.

Fig. 3. (above) Ejection of connecting rod from fixture of continuous machine is automatic.



MACHINE TOOL PROCESSES

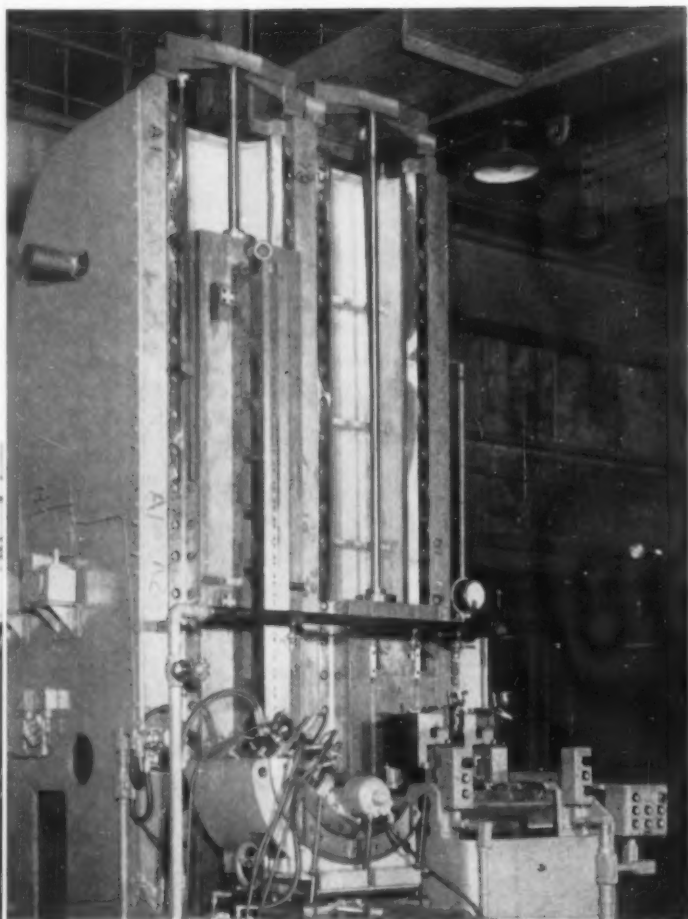
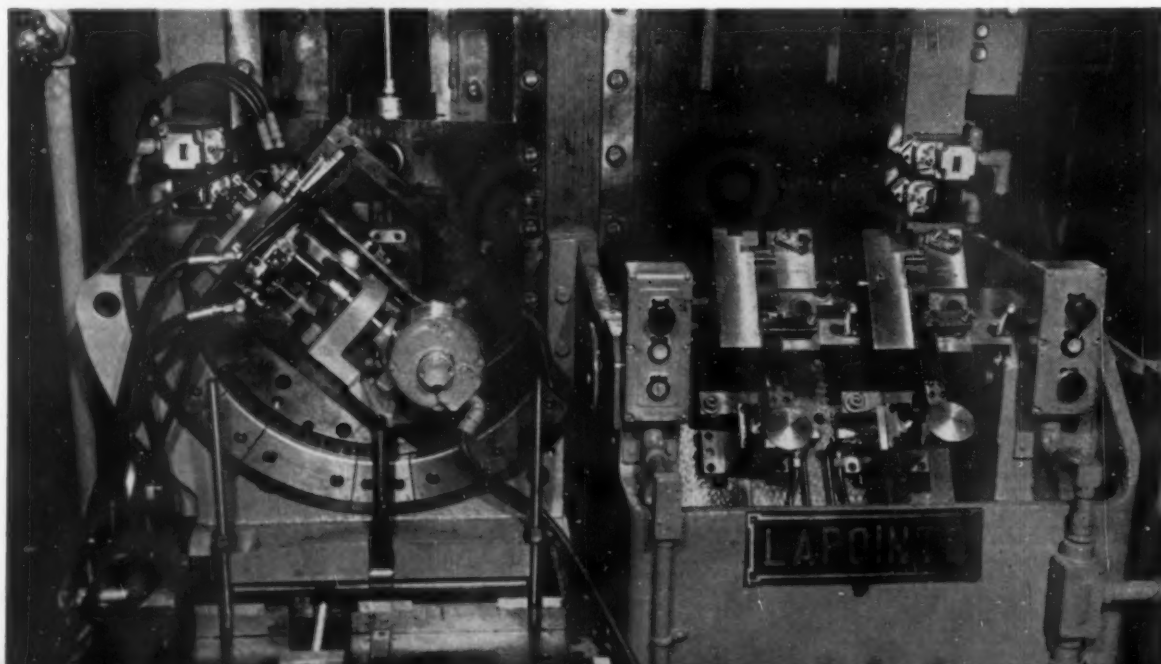


Fig. 4. Double-ram machine broaches the periphery slot in a jet turbine wheel on the left side and, on the right, broaches jet bucket roots at GE Lynn, Mass. plant.

Fig. 5. Automatic indexing fixtures which hold the workpieces during cutting are evident in this view of the machine shown in Fig. 4.



enabled the process to be used on metals that were heretofore thought impossible to broach. For example, Fig. 6, shows an electric drive 150-inch stroke broaching machine. Rigid construction results in longer tool life and the high cutting speed allows the use of carbide cutting tools on steel.

Another improvement has made it possible to broach spiral gears on an electric drive pull-up type broaching machine at the rate of 320 parts per hour, Fig. 7.

A different type of high-speed broaching operation is the finish-broaching of the "pine-tree" form on jet engine turbine disks, Fig. 8. At a broaching speed of 280 fpm, this broaching machine will cut the pine-tree forms in approximately fifteen seconds each—making a total of 235 slots per hour.

Another horizontal type broaching machine with electric drive with a 72-inch stroke was designed for an unusual application. This is internal or external broaching of involute gear sprockets. With such a machine it is now possible to accomplish a certain broaching operation on a sprocket having 25 teeth, and an OD of $5\frac{3}{8}$ inches, at the rate of 25 complete parts per hour.

Broaching is no longer confined to large production shops. Smaller broaching machines have recently been developed embodying the features of accuracy and simplicity of operation found in the larger machines but designed particularly for tool-room use. Cost of such equipment is sufficiently low that even the smallest shops can make advantageous use of the potentialities of the broaching method.

Scope of the broaching process is further indicated by some outstanding applications described in the following paragraphs.

Door closer plunger parts, formerly made as individual forgings, are more uniform and function better by being broached from bar stock. Total cost of the stock, plus the labor cost of the broach-

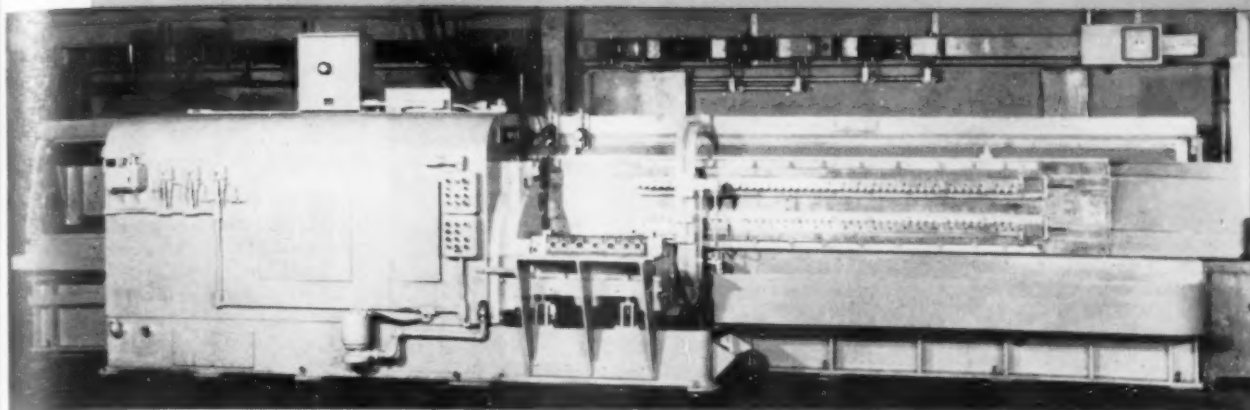


Fig. 6. (above) Automotive application for continuous broaching of cylinder cap in horizontal machine.

Fig. 7. (right) Spiral gear shown held in hand is broached in pull-up operation. Chips removed are still on the broach.

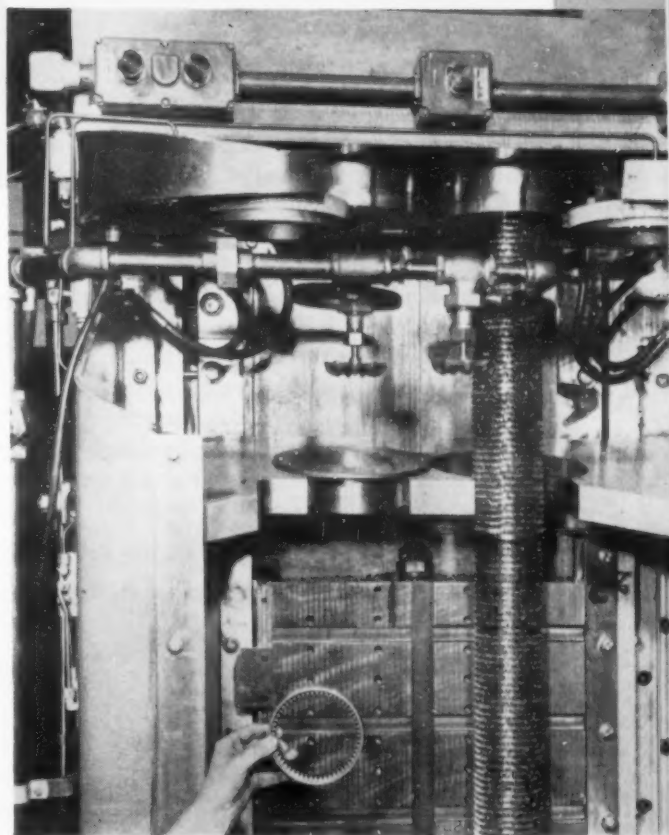
ing machine operator, is less than the price previously paid just for the rough forging.

Ordnance production involving broaching includes: breech rings, breech blocks, splines, keys, miscellaneous surface and contour work, tubes (rounded bores, flutes, arc leads); tank cupola (rest slots); gears and sleeves (straight splines, keyways, involute splines); rockets (finish slots in housings, involute forms on fins and contours). In ordnance work some of the results of broaching are rather startling. Finishing the internal recess in breech rings, for instance, is now done at a rate 80 times faster than that for the previous slotting method. Another interesting example is that of rifling. With an automatic broaching machine, machine gun barrels are rifled and the bore finished at a rate of one barrel per minute without scrap. By the old method the job took two hours per barrel and scrap averaged 5 to 10 percent or more.

Bore diameters on the 0.30 calibre and 20 mm guns are broached to roundness within 0.0002 inch and parallelism within 0.001 inch. With an automatic turret setup and cycling for broaching 0.30 calibre rifling barrels, the operator only loads and unloads the barrels.

Also, broaching is used for 30 mm accelerated lead rifling barrels. For this, 26 individual cutters are used in broaching 16 grooves, requiring 32 rms microinch finish and 0.0015-inch concentricity with the bore. Maintaining such lead accuracy in quantity lots is a real production feat. Nozzles for rockets are broached in an eight-station rotary type fixture in a fully automatic operation, *Fig. 9*. Four inverted slots 90 degrees apart are broached in each cycle of the machine.

Fluted rolls for roving and spinning frames in



the textile field are produced by broaching. These parts require an extremely fine finish with an accelerated index for each 90-degree quadrant. For the spherical surface on one surface of an inverted slot, a radial actuated broaching machine and broaching tool was designed with automatic feed plus adjustable head for easy adjustment of the tool for different ranges of radii. In another instance two holes are broached in each of an upper and lower die plate, to 0.0002-inch roundness and squareness of 0.0004 inch on a 12-inch sweep. Centre distance is held to 0.001 inch in 24 inches.

Nonparallel surfaces are broached in a turbine bucket in an interesting operation. First, parallel surfaces are produced. Then an angular surface adjacent to the parallel surface is broached. Both

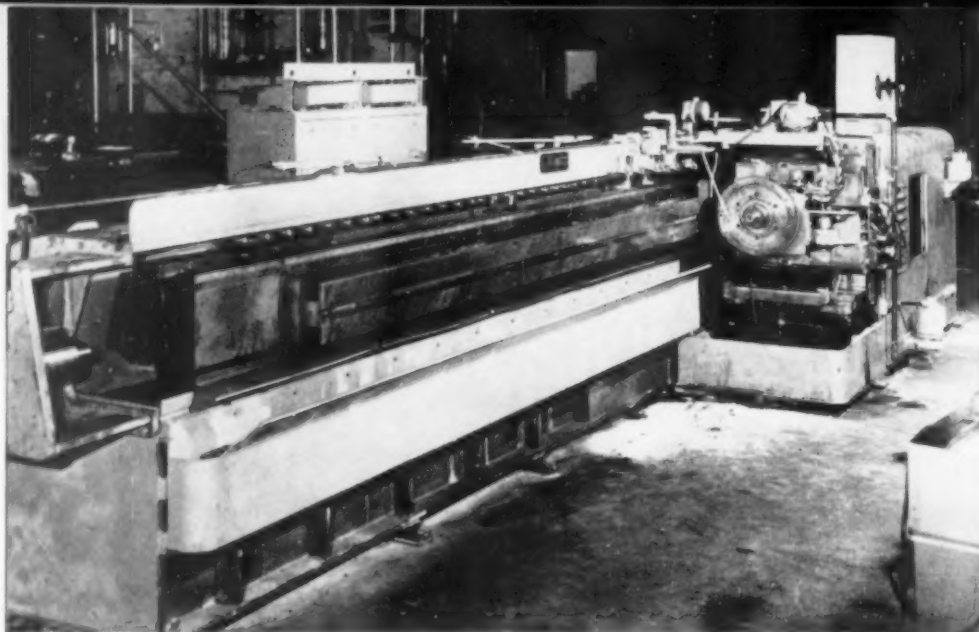


Fig. 8. Horizontal electric-drive broaching machine designed to cut pine-tree form on turbine blades.

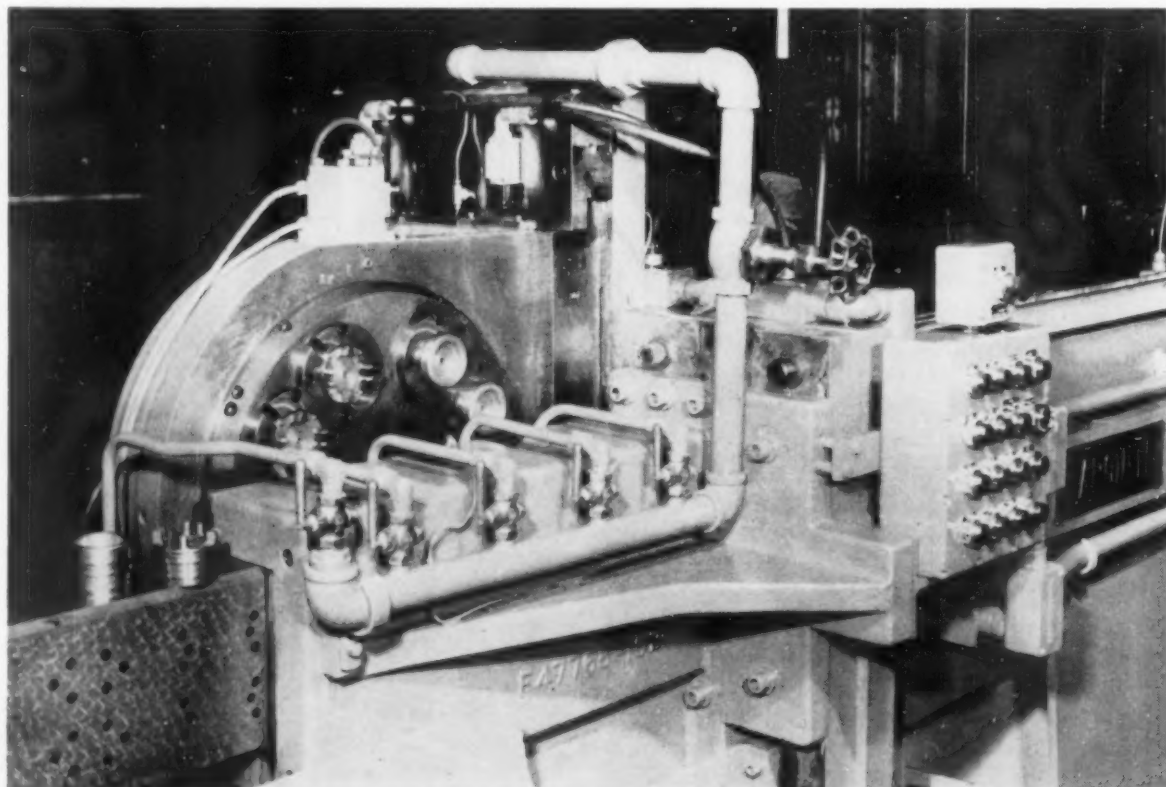
are performed in one continuous cycle. A fixture is automatically positioned to produce the parallel surface, reverting to the angular position for the adjacent cut. External and internal splines are broached in a hub and sprocket on a taper in another outstanding application. Fully automatic indexing and depth setting are employed plus an adjustable base for the angular settings.

Use of a broach sharpener in medium-size and large-size plants is an important time-saver because it eliminates the shipping of the broaches to some distant point for sharpening and at the same time

eliminates the risk of damage and the inconvenience involved. Excellent broach sharpeners are available in several sizes, and some are equipped with micrometer feed attachment for the proper sharpening and backing-off of all types of broaches.

Many shops have found that performing appropriate operations by broaching has made the difference between black ink and red ink on the annual balance sheet. Indeed, sometimes it is possible to recapture the entire cost of a broaching machine on a single order, through the differential in labor cost and in rejected parts over the previous method.

Fig. 9. Self-indexing fixture holds rocket nozzles for automatic broaching operation.



PLANING

increased speed has doubled metal removal rate

By Roland Hecker

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Fond du Lac, Wisc.

PLANERS WITH high table speeds have been available for some years but these speeds have rarely been used for cutting. In the past two years, however, the development of new tools has made 240 to 350-fpm cutting speeds common on regular production jobs. Planing with carbide has become an accepted and proved method on a wide variety of work. New planers, *Fig. 1*, are being designed for table speeds up to 400 fpm.

Attainment of this tremendous improvement has required considerable time, energy and thought. Grades of tungsten carbide were developed to withstand the impact and other special conditions inherent in planing. Better methods of brazing and clamping the carbide tips were designed, tested and proved.

In the G&L shops, with 20 modern planers of many types and sizes, use of these generally accepted carbide tools permitted roughing speeds of 100 to 150 fpm on close-grain machine tool grade castings of 40 to 45,000 psi tensile strength and hardnesses of 190 to 200 Brinell. Many variations of standard techniques have been tried in an attempt to increase these speeds but without much success. The result was always the same, too little speed capacity or insufficient cubic inches of metal removed per tool grind.

A new shear-angle planer tool, *Fig. 2*, has been developed which permits cutting speeds to be doubled and results in the removal of double the cubic inches of metal per grind. Operations formerly performed at 120 fpm are now running at 240 to 350 fpm. An estimate of savings made possible by the new tool in the 20 planers in the G&L shop is \$20,000 per year. This is the more remarkable because some of the planers are not able to use the full capabilities of the new tool. Several of

the smaller planers are used primarily for fitting of gibs and clamps, where metal removal is of relatively slight importance. Several of the others lack the speed, power or rigidity necessary for full use of the tool.

Angles of the backup wedge on the shear-angle planer tool prevent any movement of the insert under the heaviest cuts the tool can take. The

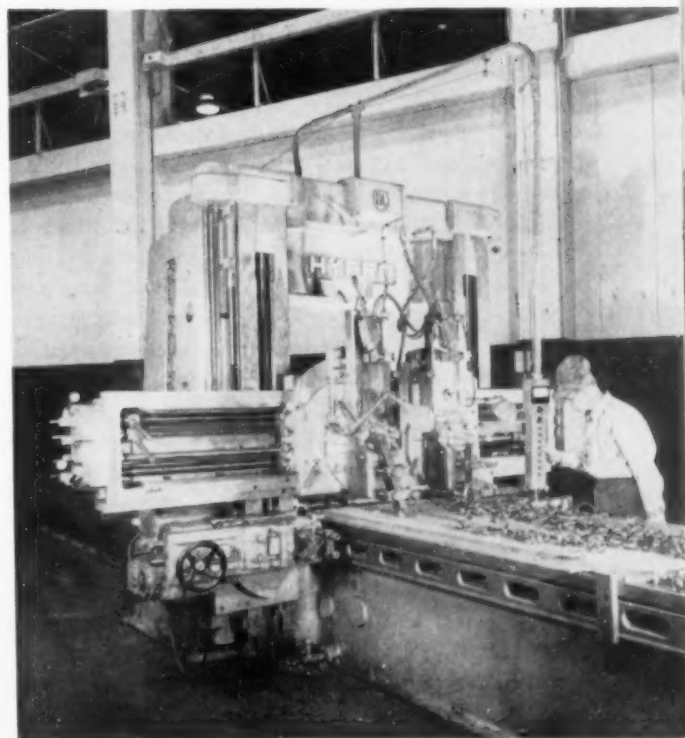


Fig. 1. Typifying the strength and rigidity built into modern planers, this unit is designed with a top table speed of 400 fpm.

MACHINE TOOL PROCESSES

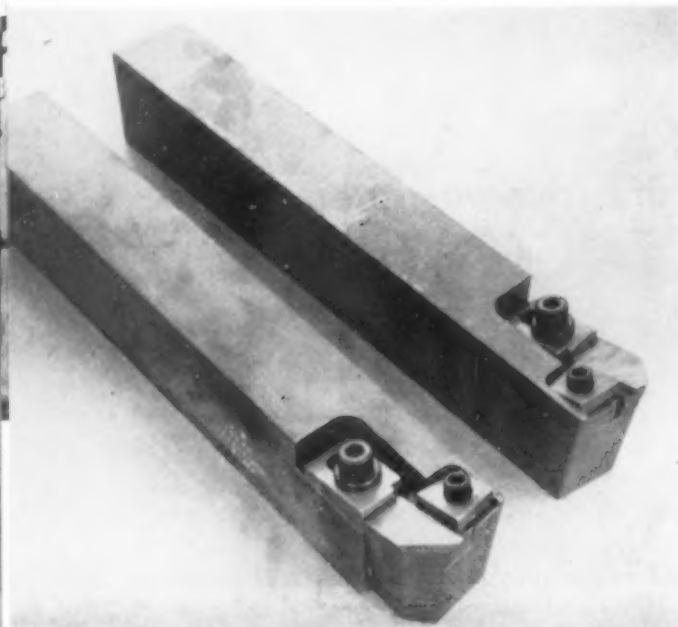


Fig. 2. Shear-angle planer tools are designed and built to get the most out of present carbide grades and will probably show even better records with anticipated new carbide grades.

bottom of the wedge is smooth to permit infinite adjustment. Maximum support is achieved because the insert overhang can be kept to a minimum. The infinite adjustment feature of the wedge also results in much less grinding of the carbide during re-sharpening.

Many disappointments were suffered before it was fully realized that all parts of the toolholder should be of as high, or higher, quality than other machine tool parts. Toolholder parts are held flat within a few ten thousandths of an inch and heat treating is carefully controlled. This tool has permitted doubling cutting speeds with standard carbide grades. Some of the newer tungsten carbides may allow even higher speeds.

In addition to doubled cutting speeds, this new tool removes more cubic inches per minute per horsepower. Tests of former tools, cutting machine tool grade cast iron of 190 Brinell hardness, have shown metal removal rates of 1.8 to 2 cu. in./min/hp. The new tools remove about 2.5 cubic inches under the same conditions. In addition, the total cubic inches of metal removed per tool grind has increased, in some instances from 1800 to as high as 4000 cubic inches. The tools will cut

through sand and hard spots of at least 250 Brinell with good tool life.

There is no simple way to take advantage of the higher productivity inherent in the new tool design. High-speed planers are absolutely necessary to fully utilize the capabilities of the tools. It may seem strange to think of minimum cutting speeds with planers, but there are such minimums. A speed of 200 fpm is minimum when planing cast iron, 300 fpm when cutting mild steel. Planers with these speeds and higher are now available, Figs. 1 and 3.

Higher horsepower is essential for cutting at these high speeds. With the same depth of cut and feed, doubling the cutting speed will require just about double the power. When the speed is doubled, about twice as much power is required to pull the table and mounted workpieces. The noncutting power requirements can be large for big tables and heavy workpieces.

Development and use of better table drives has implemented the evolution of modern planers. A hydraulic planer developed by Rockford, Fig. 3, incorporates their Triple Circuit. Instead of the older method of using one double-acting cylinder, this circuit uses two cylinders; one double acting, the other single acting. The effect of this circuit is much the same as that of the gearshift on a lathe or boring mill headstock. This circuit is designed to more fully utilize the power of the hydraulic drive

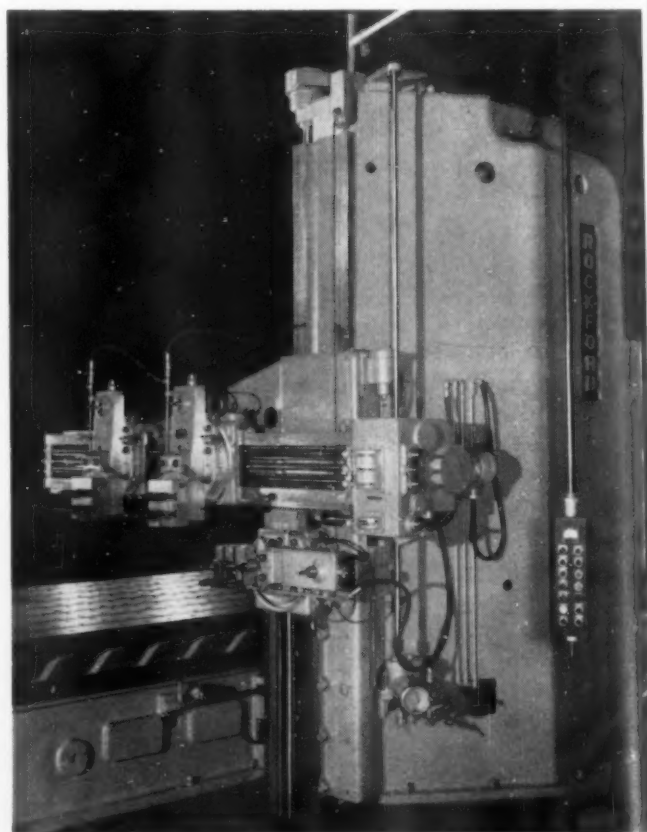


Fig. 3. Incorporating a double-acting and a single-acting cylinder in the drive circuit gives this Rockford hydraulic planer three ranges of table speed.

over a much wider range of table speeds than was formerly possible.

Table speeds can be quickly and conveniently selected with this new drive. A three-position selector in the pendant station gives the desired low, medium or high range of table speeds. The pendant also includes two pushbuttons, one used to increase and the other to decrease table speeds within the selected range. A table speed meter indicates the exact speed obtained.

The Giddings and Lewis Hypro planer uses a much improved high-speed variable-voltage electric drive. Magnetic amplifiers are used in the speed control circuit to assure long life with low maintenance. The fast acceleration of this high-speed electric drive gives more cycles of the table per minute at a given length stroke than was formerly possible. The drive is designed to maintain steady speed even under widely varying cutting loads. Independent cutting and return speeds are easily set with two potentiometers mounted on the pendant. A table speed meter indicates the exact speeds obtained.

There is much confusion concerning the rating of variable voltage planer drives. A rated 50-hp electric drive is capable of pulling much more than 50 hp at certain speeds. An understanding of this fact is important because of the present practicality

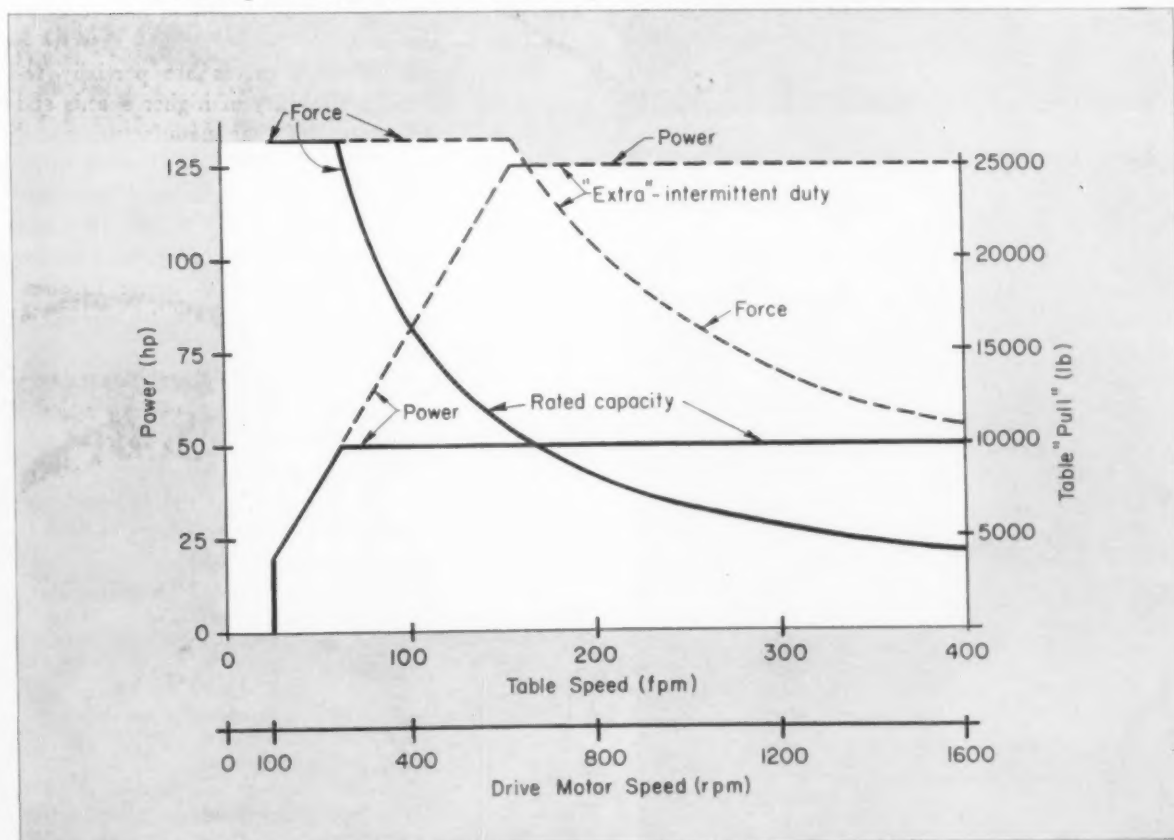
planing

of planing at 240 to 350 fpm and the high power requirements for such speeds. The curves in Fig. 4 give power and table pull as a function of table speed.

The rated capacity of 50 hp can be used continuously, independent of duty cycle. It is difficult to state how much of, and under what circumstances, the extra intermittent capacity can be used since this is dependent on duty cycle. More of the extra capacity can probably be used with long strokes than with short. Although 125 hp is shown as maximum on the curves, the absolute limit of available power can be much higher. Actual values up to 148 hp have been recorded. The absolute limit is determined by the overload characteristics of the alternating current motor driving the generator and the heating of the direct current motor.

Since higher speeds are now practical, it is generally possible to complete most operations before the overloads kick out. For example, the operation that used 148 hp was completed in about $\frac{1}{2}$ hour. It is of course possible to set up combinations of speeds, feeds, depths of cuts, types of material and numbers of tools that will stall any planer. A planer that could take any conceivable speed, feed

Fig. 4. Power and table pull requirements plotted as functions of table speed for 50/125-hp electric drive indicate the extra power available for high-speed cutting jobs.



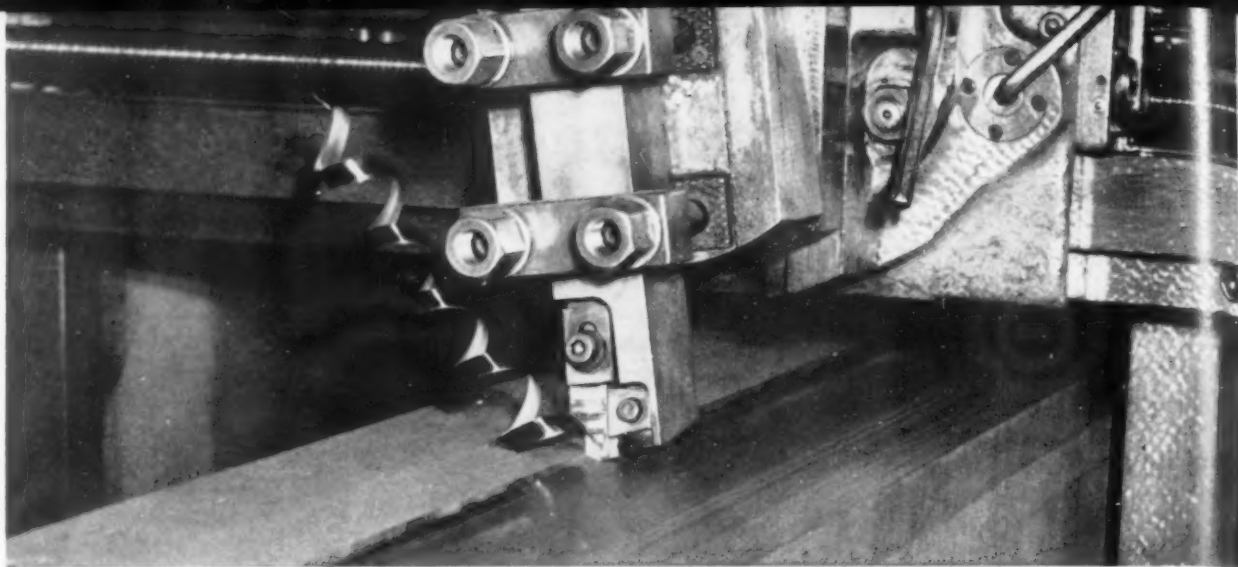
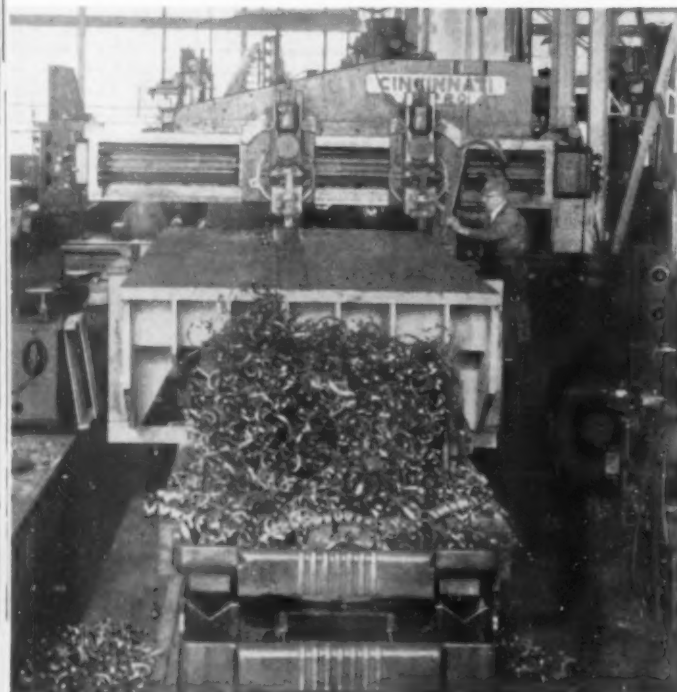


Fig. 5. New cutting tool used to plane a mild steel weldment with huge savings in time over previous equipment and methods.



and depth of cut would be much too unwieldy and expensive for most planer users.

Table speeds of 240 to 350 fpm require absolute protection for the table way surfaces. Nonmetallic table ways are recommended by most planer manufacturers for all planers but especially for high-speed machines. Cost of such nonmetallic ways is slight compared to the investment they protect. Positive way lubrication is another requirement for high-speed planers and protective interlocks between the lubrication system and the drive must be provided to protect the workpiece and tools as well as the machine.

Better gears for table drives are partially responsible for the availability of higher speeds and powers. Closer control of gear manufacturing and inspection has reduced backlash by as much as 50 percent. The slight backlash remaining is imperceptible even at reversal of the table. This has resulted in smooth table operation without jumps or jerks, which leads directly to better finishes, longer carbide tool life and the ability to sustain high-speed cuts.

Insufficient rigidity of many older planers can prevent full utilization of higher cutting speeds. Impact or shock on the machine and the tool are considerably greater at high speeds than low. It can be seen in Figs. 1 and 3 that the rail and rail heads are considerably heavier than they were formerly. High productivity of the improved tools cannot be used unless the machine on which they

Fig. 6. (center) Two cutters, heavy workpiece and high table speed of 250 fpm combine to impose a load of 148 hp on this planer drive.

Fig. 7. (left) Material removal possibilities are indicated by this picture of a planing operation on tough steel in a die shop.

are used is in first class condition and has enough rigidity to support them.

All modern planers include safety measures for stopping the table in case of a loose dog, electrical failure, ruptured line, etc. Stopping methods include such devices as cushions in the ends of cylinders on hydraulic planers. Whatever the means of achieving it, safety is assured at all table speeds.

Some remarkable savings in machining time have been realized when using high cutting speeds. Typical of the savings possible is the finishing of a mild steel, 1020, weldment 12 by 14 by 164 inches with $\frac{1}{4}$ to $\frac{1}{2}$ inch of finish stock. The chip formed by the shear-angle planer tool during this job is clearly visible in Fig. 5. The workpiece was machined in three steps, roughing, semifinishing and finishing. Total time for the job, using former high-speed steel tools and table speeds of 35 and 40 fpm, was 24 hours. With tungsten carbide inserts in the shear-angle holder and a cutting speed of 300 fpm, time required was 9 hours.

Not only is 62.5 percent of the former machining time saved but distortion due to planing of the weldment is less. This is probably because, with the new holder, more of the generated heat is dissipated in the chip. A cutting speed of 300 fpm was selected for this operation only because it was the maximum speed of the planer. It was found that with speeds much under 300 fpm the metal had a tendency to tear.

Rough planing of a close-grain machine tool cast-iron floor plate, Fig. 6, requires high power availability. Two tools, with an average depth of cut of $\frac{5}{8}$ inch and 0.094-inch feed per stroke, are used on this 48 by 148-inch part having a hardness of 187 Brinell. Cutting speed is 250 fpm and power requirements totaled 148 hp, including 17 hp to move the table and work load. Return feed on this job was 400 fpm and the entire operation was completed in less than $\frac{1}{2}$ hour. About 4,400 cubic

planing

inches of stock was removed without need for tool changes.

Another typical application of the new tool is shown in Fig. 7. Fairly tough steel is machined at 200 fpm with a $\frac{3}{4}$ -inch depth of cut and $\frac{3}{32}$ feed. The entire width is planed without tool changes. On cast steel, cuts of $\frac{1}{4}$ to $\frac{1}{2}$ inch in depth with a feed of $\frac{1}{16}$ inch have been successful at 220 fpm.

Better grades of carbide have made gang tools, Fig. 8, practical. The tools illustrated have reduced floor-to-floor time by 14 percent on one job and saved about \$4000 the first year. Mist cooling seems to present definite possibilities in planing, Fig. 9, especially on parts requiring the use of high-speed steel tools.

Productivity of planers has increased rapidly recently because of new tool designs and rigid, high-speed, high-power machines capable of using the tools. When productivity is a production prerequisite, planing should certainly be considered.

Acknowledgments

The author gratefully acknowledges information, aid and assistance furnished by: The Rockford Machine Tool Co., and the staff of Giddings & Lewis Machine Tool Co., especially Erwin Kaiser, manager of the Davis Tool Div. and Walter Thuerwacter, tool supervisor, who between them developed the Shear-Angle planer tool.

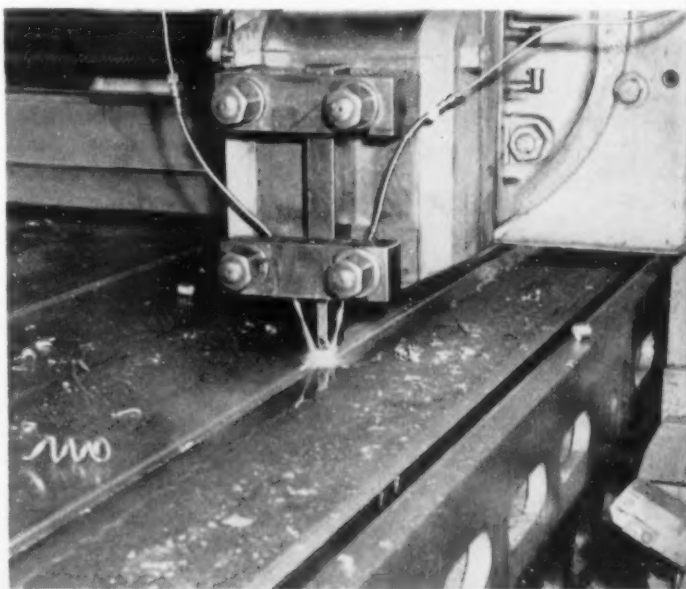
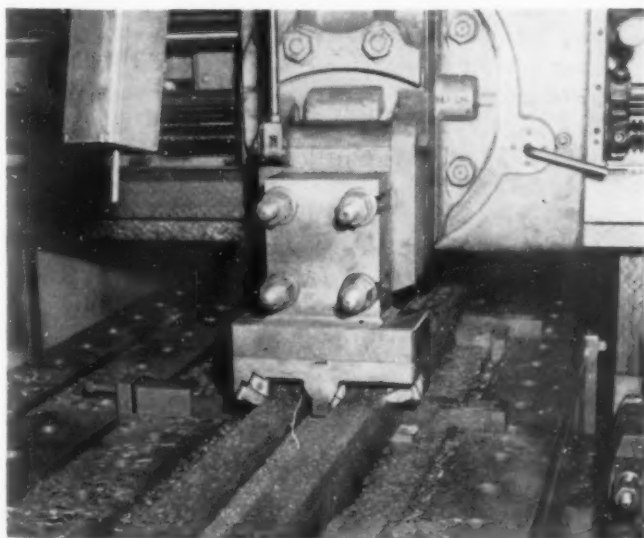


Fig. 8. (left) Typical gang tool used for semifinishing hardened bedway of a horizontal boring, drilling and milling machine.

Fig. 9. (above) Mist cooling used to aid in planing T-slots in mild steel weldment with high-speed steel tools.

TURNING

*improvements include greater rigidity,
better controls, higher speeds*

By Carl F. Pabst

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INDUSTRY is constantly seeking higher production, greater efficiency as well as a reasonable return on capital investment. Generally, the current demand in lathes is for a machine which is durable and capable, not only for a particular type of job but versatile as well. Ease of operation, simplicity, plus attractiveness in appearance and minimum need for maintenance are other important factors. Some jobs require special turning equipment, Fig. 1,



Fig. 1. Contour facing operation on stainless steel rotor compressor wheel for jet aircraft engine is performed on T-lathe using variable speed control.

while many others can be accomplished most advantageously on tracer controlled lathes.

Turning equipment can be divided into four categories:

1. Engine lathes including toolroom lathes.
2. Special turning machines for limited production.
3. Special turning machine for high production.
4. Tracer controlled lathes.

No mention is made of things that might be looked upon as sales "gimmicks." While the lathe industry has its share, it is well to remember that because of the varied needs of industry an item or feature considered by one user to be a gadget may be an essential piece of equipment to another. Thus lathe builders are providing the things that extensive research has dictated.

Engine Lathe Developments

While special-purpose lathes have been developed for special jobs, the engine lathe is still the basic production machine. In all but very high-production industries the engine lathe continues to be a useful machine. However, the engine lathe of today with its array of optional special equipment is far different from that of a few years ago. Perhaps the most notable change has been the emphasis on higher power and greater rigidity. Much of this change has been due to rapid advances in cutting tools and is associated with better control of available material.

Increased Cutting Speeds: Cutting speeds today are 50 percent higher, in general, than they were a few years ago. Cutting speeds in the range of 400 to 800 fpm on steel are not uncommon. One well-known machine tool manufacturer has con-

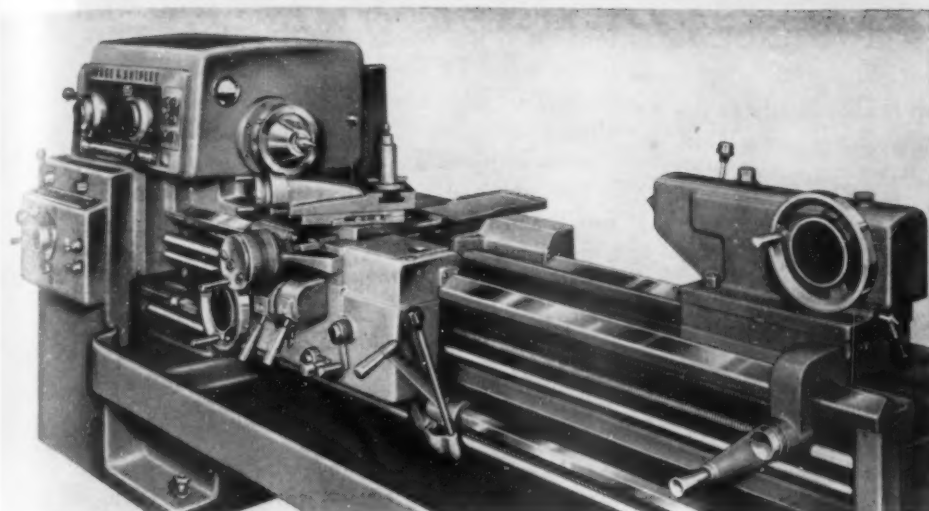


Fig. 2. Present engine lathes such as this embody many refinements, including gear reduction unit which permits changing tailstock ratio for drilling merely by throwing a lever.

tributed much to the extensive experimentation in metal cutting. Cutting speeds in excess of 1000 feet per minute have been shown to be possible in these experiments.

Horsepower has increased so much that today, for example, a 13-inch rated capacity lathe may have a 20-hp drive. An example is the new Lodge & Shipley 13-inch Power-Turn Lathe, with spindle speeds up to 2000 rpm and a maximum of 20 hp, shown in Fig. 2. Formerly, a corresponding lathe was powered with a 5-hp motor.

Introduction and wide acceptance of the slug type carbide tool bits has increased demand for greater power. These relatively inexpensive bits are easily replaceable in clamp-on tool shanks and are well suited to heavy roughing cuts.

Development of better heat removal methods, although not as yet in extensive use, shows promise of further increasing the metal removal possibilities of machine tools. One of the more popular methods uses a finely divided coolant spray or mist at the edge of the cutting tool where the chip impinges.

Durability Features: In keeping with the greater power and rigidity of machine tools is the emphasis on durability. This requires better use of material and better methods of manufacture. Since the hardened lathe bed was introduced some years ago, builders of turning equipment have developed numerous other quality improvements, such as hardened cross slideways. These have even been made detachable and replaceable in some instances, so that repairs can be made in the shop without the necessity of shipping bed and carriage to the manufacturer.

Higher speeds and higher cutting loads have caused design engineers to take a new look at anti-friction bearings in the headstock and in the geared units. Special bearing mountings have been developed which make higher speeds practical. Some

of these mountings compensate automatically for thermal expansion and thus the machine maintains its precision at low, moderate or high speeds.

Much has been done recently in developing better systems of lubrication. Increased speeds and horsepower have increased lubrication requirements. Many lathe manufacturers are using cartridge type filters which remove particles as small as 5 microns or smaller and filter all of the oil in the system, by-passing only when the cartridge becomes completely loaded. One method of lubrication, using a finely divided mist or spray atomized by air pressure, has been developed. Use of pressure lubrication, in which each point is supplied with the proper quantities of oil through a meter fitting, has been extended.

Because of maintenance difficulties in some



Fig. 3. Production lathe with color-coded geared headstock exemplifies trend to simplified controls. Spindle speeds range from 136 to 2000 rpm.

MACHINE TOOL PROCESSES

plants extensive use has been made recently of the grease-pack antifriction bearing. Since heavy lubricants are available, which will not run out of bearings even under extreme conditions of heat, bearings can be prepacked for the life of the bearing and no further lubrication is required. These bearings have been used in many places where failure to lubricate might cause serious trouble or failure. The best modern turning equipment has become almost completely automatic in lubrication and requires a minimum of maintenance.

Ease of Operation: Another important trend in the development of the modern engine and tool-room lathe is toward greatly improved ease of operation. Much has been done to reduce operator fatigue and simultaneously save time and reduce cost. For instance controls have been grouped, made more accessible and designed to operate functionally directional. In many cases the number

of control levers has been greatly reduced. Where formerly it was common practice to have a number of levers for control of a multiple-speed headstock, the same functions now are often accomplished with one or two color-coded levers at considerably reduced effort.

Use of color-coding for selective settings of speeds and feeds is increasing. Color-coding makes it possible for the operator to select lever positions merely by matching colors. Dials and instruction plates are more easily read even from a distance. Design lines are such that attachments, optional equipment and motor drives seem to have a pleasing effect where formerly they were often unsightly protuberances.

Direct reading measuring attachments for both the cross slide and carriage travel are available on most quality lathes. These instruments allow direct reading of diameters and shoulder lengths in increments of less than 0.001 inch after the initial pre-setting. These attachments are valuable time savers for small-lot work. For instance, on the machine shown in *Fig. 3*, dual direct reading dials on the cross feed and a direct reading dial for the carriage travel are provided.

Other Improvements: Handwheels have been moved to a convenient operating position so that the operator may load and unload work between centers with minimum effort. Built-in gear reduction units make drilling from the tailstock simpler and easier. Change-over from a 1 to 1 ratio for normal operation to 5 to 1 ratio for drilling, can be accomplished by a slip of a lever or a twist of a knob, *Fig. 2*.

The trend toward better appearance has become evident to even the casual observer. While styling may be primarily for sales appeal, it nevertheless

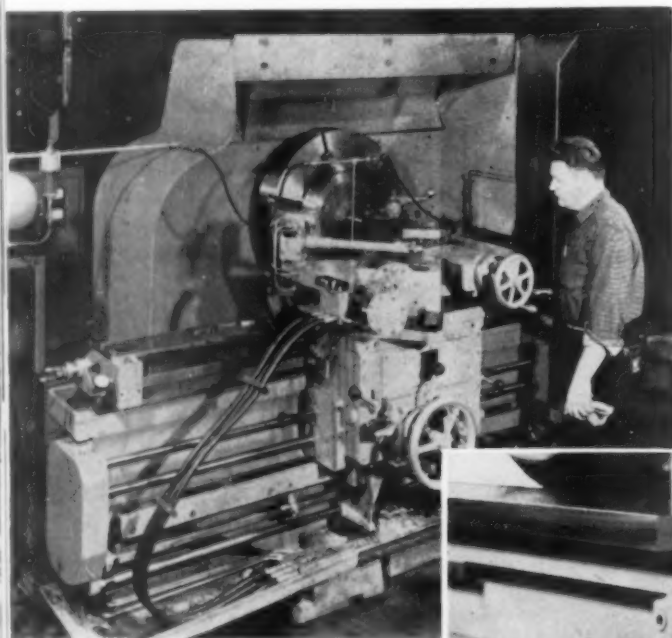
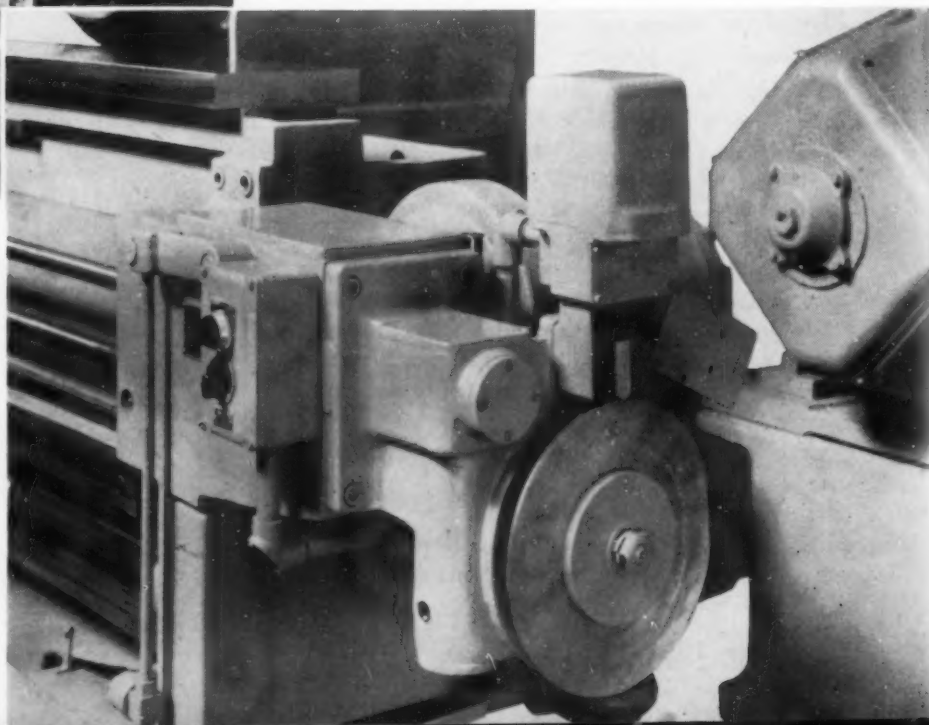


Fig. 4. (above) Special turning equipment for large diameter workpieces. The setup for initial facing operation involves use of CO_2 coolant.

Fig. 5. (right) Drive, cam and motor which provides variable-speed control for constant surface speed on T-lathe.



has contributed greatly from a functional standpoint. Formerly little attention was paid to styling, perhaps because machine shops were considered to be necessarily dirty and disorderly places. Now the machine shop is taking on a new look, so likewise is the equipment that goes into it. Lathe builders have, however, avoided the use of chrome and trim for appearance only. By simply reshaping units to eliminate unsightly dirt catching pockets much improvement has been secured, sometimes at reduced cost because of simplified tooling.

Special Turning Equipment

Beyond the realm of the "work horse" engine lathe, what is happening in the field of special turning equipment? Recent emphasis on production of the jet engine has brought about the development of the T-lathe, shown in *Fig. 4*. Many jet engine parts require facing, boring and turning of large diameter, thin sections. Most of the turbine and compressor disks on the jet engine require contour facing which can be done more conveniently on a lathe with a bed set at right angles to the spindle face.

The design of this machine lends itself to the use of two or more tracer controlled independently operated carriages on the same bed. Electronic variable-speed drives have permitted constant cutting speed in facing and contouring large diameter work, *Fig. 5*. The T-lathe has also found wide acceptance in other industries where facing and contouring of large diameter work is required.

Tracer Controlled Devices

Any discussion of turning equipment must necessarily include the trend toward the use of duplicating or tracer controlled devices. With this equip-

turning

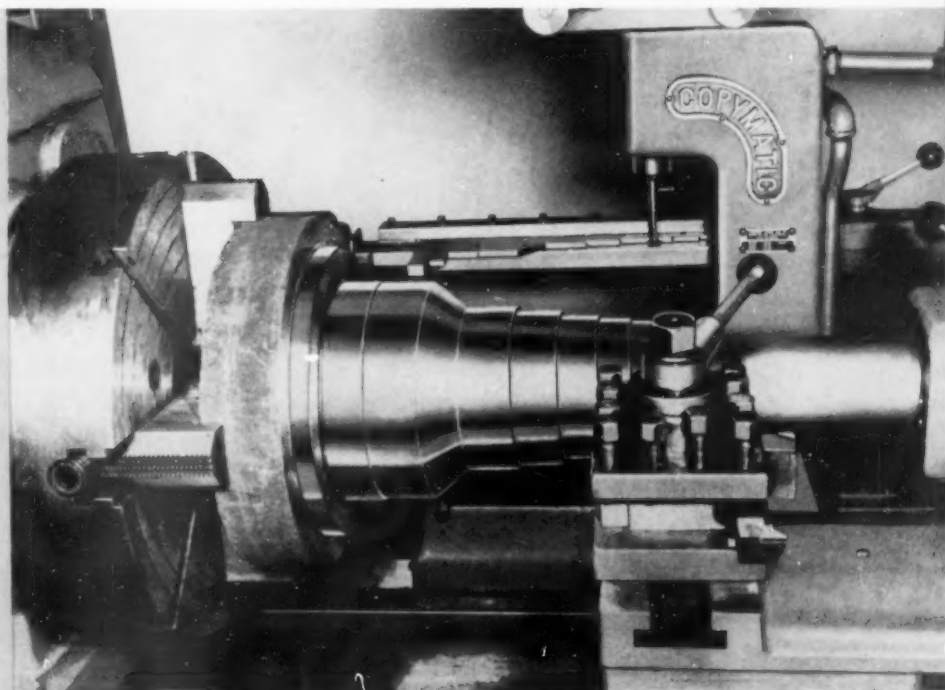
ment the operator can duplicate on the workpiece physical dimensions of a flat or reund, full size or reduced template, mounted on the machine. The operation is performed by the follower or stylus of the control device traversing the template, *Fig. 6*.

On engine lathes, tracer controls are of two main types. One has the controlled tool-carrying slide at 90 degrees to the bedways, as on a conventional lathe and requires a longitudinal feed interrupting mechanism to allow facing of square shoulders on the work. This type has the advantage of allowing the machine to be used as a conventional engine lathe whenever use of the tracer is undesirable. The second type has a controlled tool-carrying slide at some angle other than 90 degrees to the axis of centers, usually 45 degrees. This type has an advantage in simplicity and allows facing of right-angle shoulders without interrupted feed, but makes the machine somewhat awkward to use as a conventional engine lathe.

What About The Future?

What is in the future in the way of turning equipment? Perhaps no radical departure from present trends, but a further continuation of developments of the past few years: Higher power, greater rigidity, increased ease of operation, more automatic features. Extensive use of handling equipment for both work and chip disposal will be in increasing demand if better production standards are to be secured. Machine tool builders can suggest what may be in the future but users of turning equipment must dictate the real direction of future development.

Fig. 6. Step turning of armament part being performed in tracer controlled lathe. Flat template is used.



BORING

multiple operations solve production problems

By W. Thompson
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IN PLANNING for boring operations, it frequently proves advantageous to include other operations and perform the job on multiple-spindle chucking equipment. Although it may be difficult to determine exactly how special equipment may be used on multiple-spindle machines, the possibilities of reducing the manufacturing cost of a part are tremendous. The following discussion of a few typical production problems and their solutions will indicate the advantages of combining operations.

In Fig. 1 is illustrated a method of solving a dual problem that the tool engineer faced in manufacturing a part Fig. 2, so that it would have close tolerance on a bore, which is finished during one operation. This bore is used for location purposes for the second operation. By adding a precision boring spindle to the seventh station on the machine, the problem was solved.

In order to maintain the tolerances required on the bore, it was necessary that the work be stopped from rotating and the precision boring head be driven by a special motor drive. Since there is no index error or generating on diameters when the work is stationary accurate boring size can be maintained. Therefore, by the use of a double-index multiple-spindle machine, a savings in capital equipment and floor space is reflected in addition to releasing the service of a skilled operator for other assignment.

Another problem is illustrated in Fig. 3. This automotive transmission housing has two distinct center lines. In other words, the part is chucked to the center line of the flange of the work so it can be machined. Boring and facing operations

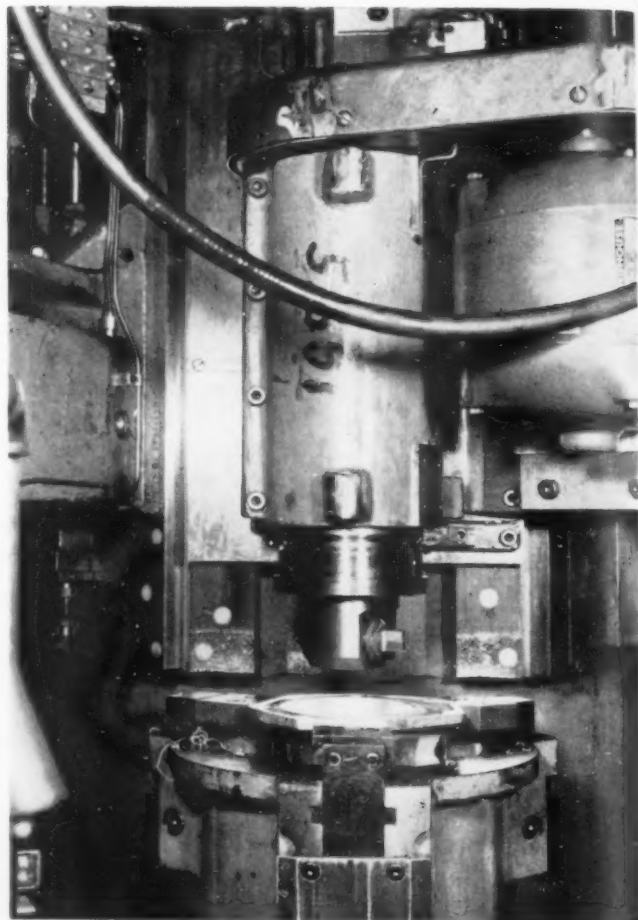


Fig. 1. Precision boring head machining a transmission extension housing.

must also be done on the offset from this flange center line. To machine this part on two different center lines, it is processed on an automatic chucker, using a simple offset boring and facing head in addition to standard tooling. The spindle in which the part is chucked, would rotate on its center line but is held stationary on the center line of the offset bore by a special lock pin arrangement. When these operations are performed and the ma-

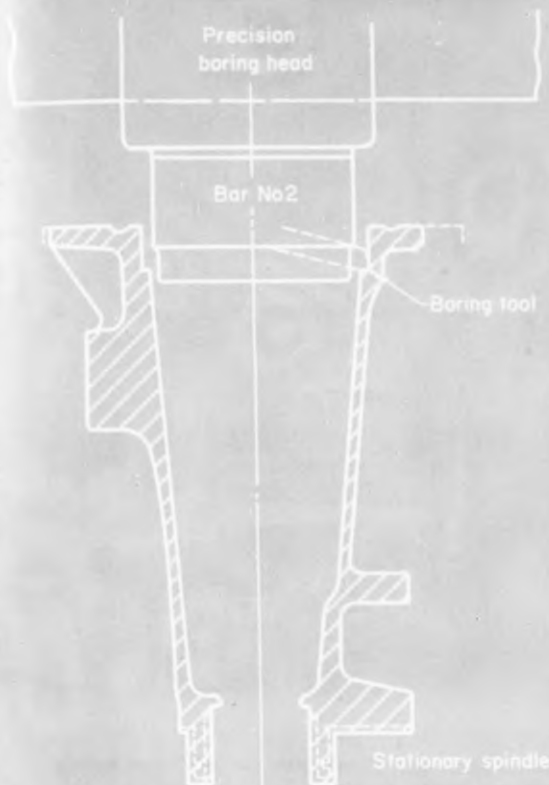


Fig. 2. Detail of operation in Fig. 1 showing work-piece and boring operation.

chine is indexed to the next position, the lock pin is withdrawn and the work then rotates about the flange center line. Thus, by using a special head on a multiple-spindle machine, extra handling of the part is eliminated.

Spherical surfaces can be bored on automatic machines, using simple radius boring equipment, Figs. 4 and 5. This device has a number of varied applications and the design incorporates a non-scoring feature so that no tool mark or drag-back occurs on the finish cuts. Application of this type of head permits these operations to be done as well as the usual boring, facing and turning operations on automatic machines.

On a new automotive part the design was changed so that the flange and locating diameters are elliptical. In addition to boring, other machining operations include multiple-spindle drilling, countersinking and reaming. The part is processed so that two eccentric facing cuts and two eccentric turning cuts are taken, combining these unusual operations with the standard machining operations.

A cam-controlled eccentric facing and turning head, Fig. 6, has been added to the machine as a special device. The part is located in a chuck provided with the necessary location points to relate it to the true positions of the elliptical turning and facing head. The eccentric boring and facing heads engage a driver, which in turn drives the eccentric

Fig. 3. Boring head rotates to machine offset bore when chuck spindle is held by a pin.

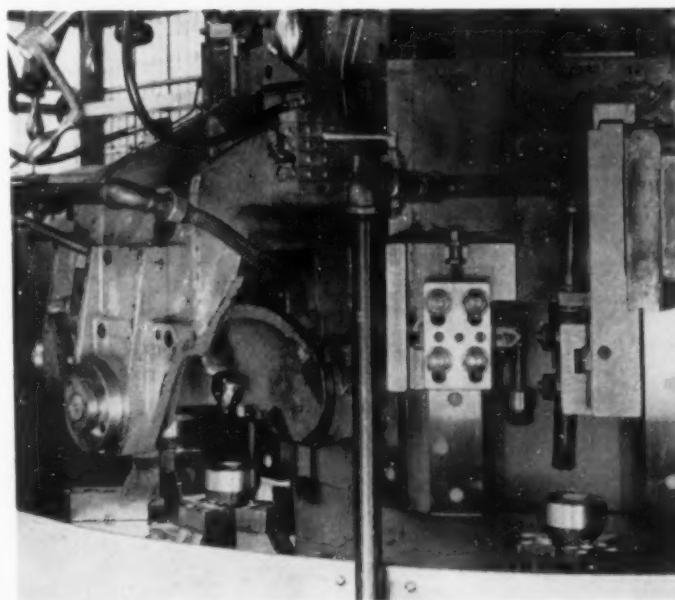
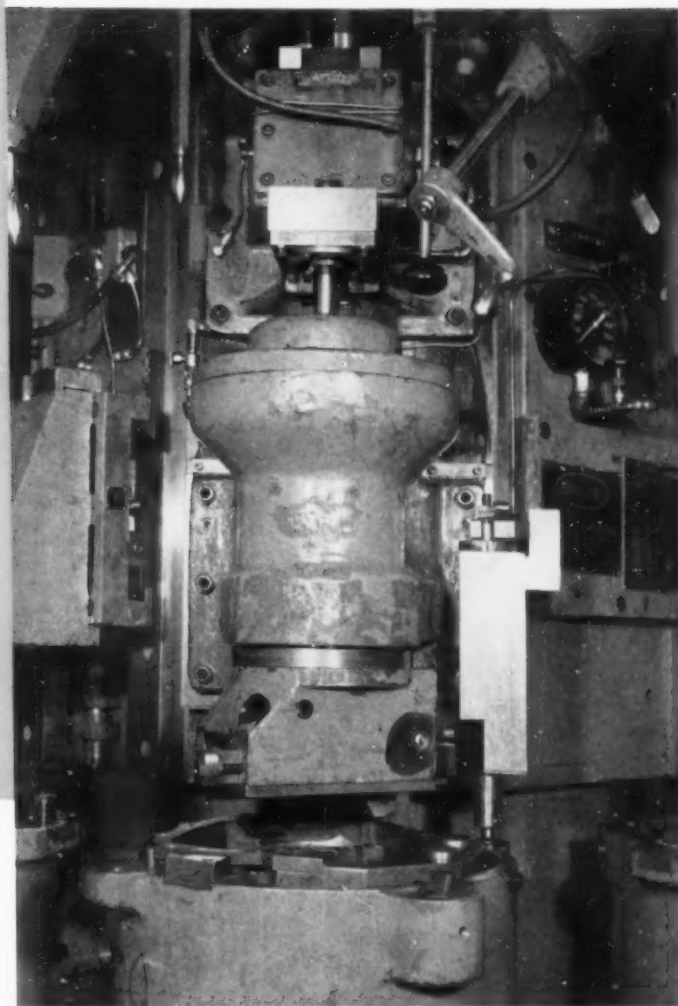


Fig. 4. Spherical boring head machining an outer-race ball.

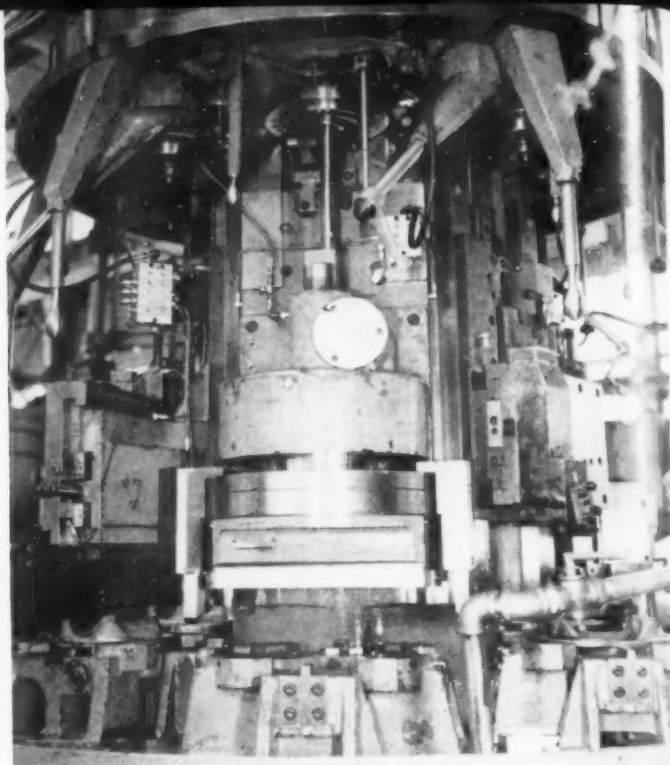
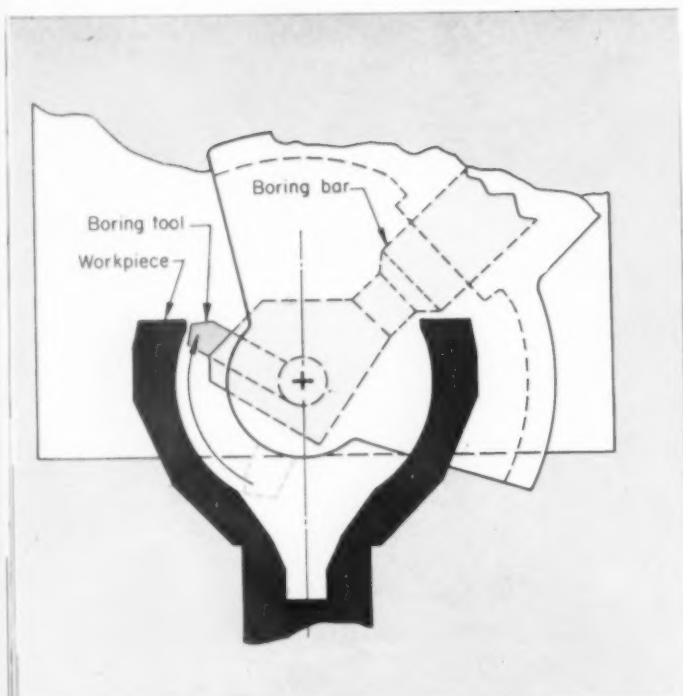
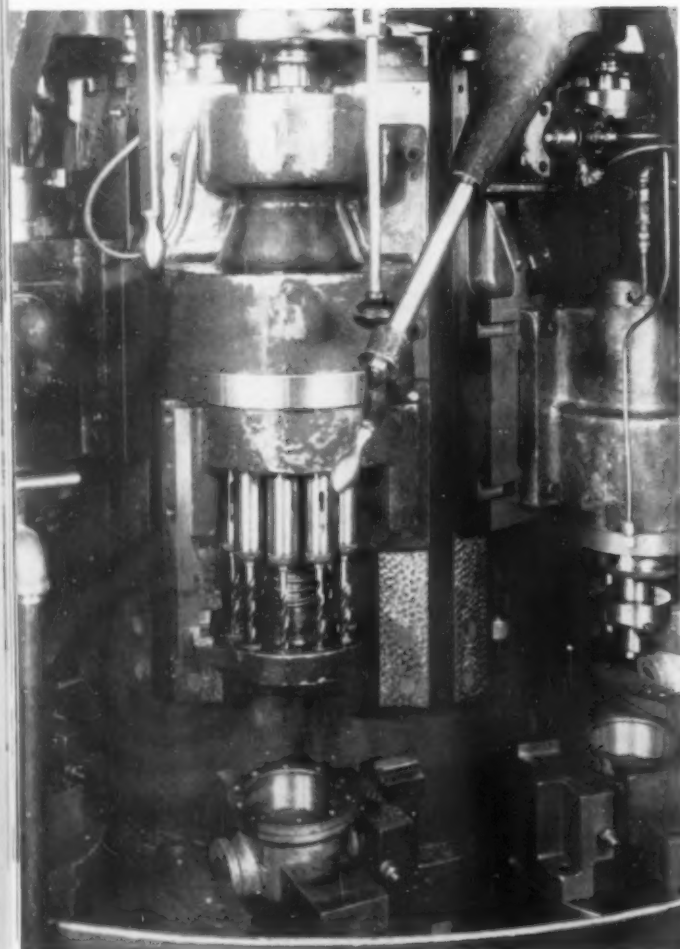


Fig. 5. (upper left) Tool path for spherical boring setup shown in Fig. 4.

Fig. 6. (above) Differential carrier with elliptical flange is completely machined on automatic chucker.

Fig. 7. (lower left) Boring, drilling and tapping stations for machining a rotary-pump body.



head in the cam path, developing the elliptical diameter. A subslide is added to this head for the cross facing operation.

Thus, the need for milling equipment to mill the face of the flange has been removed and floor to floor machining time has been reduced since all other required drilling and reaming operations are being performed at other stations while the machining of the flange is being accomplished.

On high-speed chucking equipment and chucking equipment where each station has the same spindle speed, it is sometimes necessary to bore parts at speeds which would be prohibitive for multiple-blade reaming operations. So that the multiple-blade reamers do not run at excessive speeds it is possible to add a live spindle drive, the differential speed of which will allow any desired speed on the reamers.

There are many times when a process engineer must determine whether there is a definite advantage in including multiple-spindle drilling and reaming operations on automatic chucks. On many parts, tremendous savings can be achieved by combining these operations. Multiple-spindle drilling, reaming and tapping can be done economically and satisfactorily by adding multiple-spindle heads for these operations. There are a number of ways that these heads can be used.

If there is no relation between the holes and some other surface, one way would be to use stationary work spindles with a nonrotating multiple-spindle head. If there is a relation between the holes and some other surface on the work, it is necessary that the part be located in a chuck or fixture, registering it for location with a driver. This driver engages the driver of a multiple-spindle drill head so that when engaged the multiple-spindle carrier is rotated at the same speed as the work spindle. The drills and reamers are guided by the usual bushing plate to hold the spacing and the drills are fed through the work by the feeding mechanism of the machine to a preset stop.

boring

Three combined operations on an automatic chucker are illustrated in *Fig. 7*. A precision boring head is at the extreme right, a multiple-spindle drill head in the center and a multiple-spindle tapping head at the extreme left.

Combining operations in this manner can result in tremendous savings in production. The planning time required and investment in equipment are amply repaid by increased production and reduced unit cost of the workpiece.

DRILLING • REAMING • TAPPING

multispindle machines and indexing operations

By R. A. Schafer

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METHODS OF MAKING drills, reamers and taps have long been well established, but manufacturers of these tools are quick to improve both methods and tools. Advantages inherent in high-speed steels and carbides were quickly recognized and these materials have been incorporated in tool designs. The finest tools, however, are valueless unless they are correctly applied. Proper speeds and feeds, as well as sequence of operations, *Fig. 1*, play an important part in modern production.

Economical mass production of parts requiring either smooth or threaded holes necessitates formation of a planning organization and selection of machine tools adaptable to product specifications. Machining operations should be combined wherever possible to save time and reduce handling. Combination tools are not the only solution. Possibili-

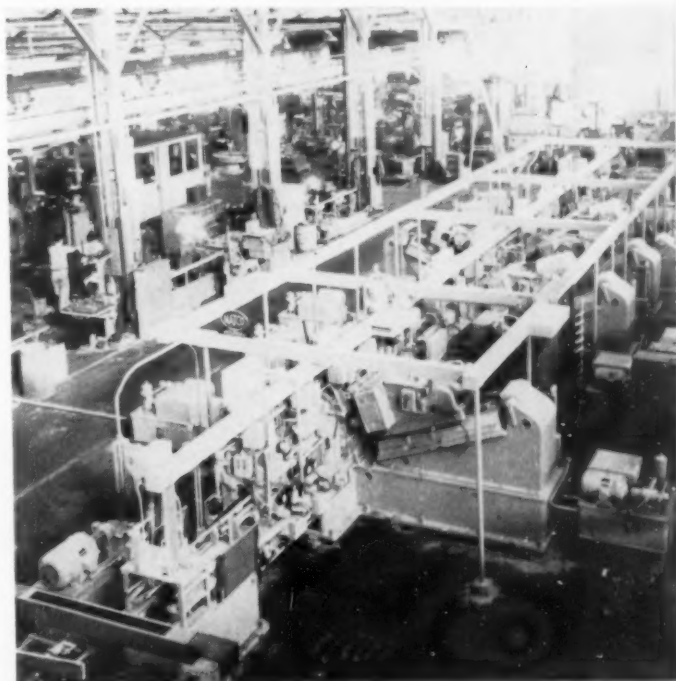
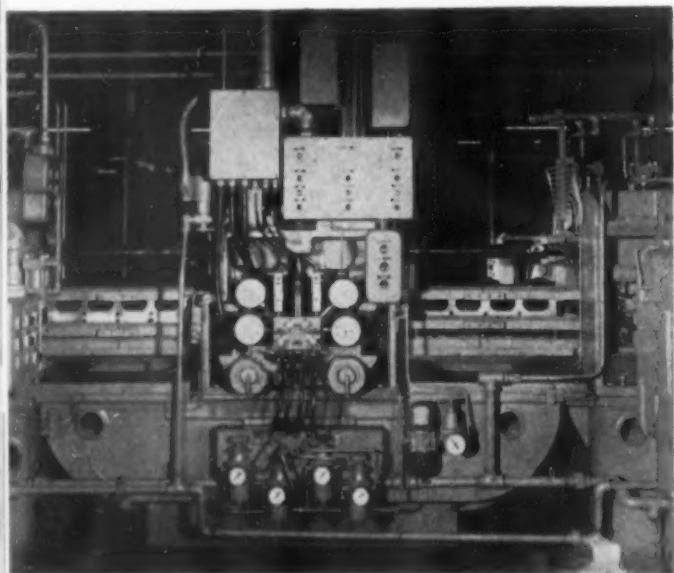


Fig. 1. Holeway machine used in a continuous production line for mass production of an automobile engine cylinder head.

MACHINE TOOL PROCESSES

Fig. 2. Typical gaging station in the continuous production line machine of Fig. 1.



ties of multiple spindles, multidirectional machining and machining of several parts simultaneously should be considered.

The most common use of drills and reamers is in drilling machines. Most drilling machines rotate the tool and feed it into the work. Lathes, gun-drilling machines and some special-purpose machines rotate the work with the tool held stationary. In addition to the standard types of drilling machines, sensitive and heavy-duty machines should always be considered when planning drilling operations.

When part configuration prohibits simultaneous machining of several holes, operations must be performed in sequence. In such instances, it is advantageous to index the workpiece through an arrangement of fixed-position spindles. The part can be automatically positioned at each station with a minimum of handling. This technique can also be applied in combination with other operations such as milling, broaching, testing and gaging so that complete machining of a workpiece can be accomplished with just one loading step.

Various types of indexing methods are in common use today. Rotary tables are used in which workpiece holding fixtures are mounted on a movable table that is indexed through angular spaces. With trunnion types, fixtures are mounted around the periphery of an axis and indexed through angular spaces. Two methods of straight-line indexing are used. In one, work-holding fixtures are moved along a straight line a predetermined distance and are located at each work station. In the other, work-

pieces are moved directly on the line without fixtures and are located at work stations from previously machined points.

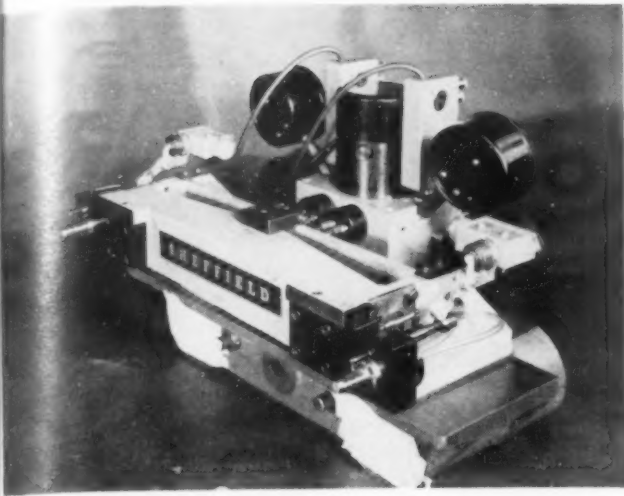
Progressive evolution of the multiple-way machine has led to the construction of continuous lines of Holeway type processing machines through which workpieces are automatically processed. A typical processing type Natco Holeway machine, Fig. 1, is used in a continuous production line for mass production of an automobile engine cylinder head. A typical gaging station in this machine is shown in Fig. 2. The gage head, which measures the sizes of two reamed holes and the distance between their centers, is shown in Fig. 3. A rejection by the gage automatically prevents continuing operation of the entire sequence of operations until the trouble has been corrected.

It has been found that, since the application of air gages to check distances between two holes, accuracy is for the first time really appreciated and truly maintained. When the sequence of operations is planned, the condition of the workpiece and its temperature must be known. Distortion, caused by excessive metal removal or an extreme temperature change, can seriously affect the distance between two holes and thus change location of a workpiece in succeeding operations.

Other types of gaging stations are also used in the engine cylinder head machine. Air gages are used to determine hole diameters and center distances between holes, to check porosity by pressure and to determine hole depth with a probe. Probe gaging for hole depth is especially valuable as an operation preceding tapping because it is important to know that the hole is of sufficient depth to avoid breakage before inserting a tap.

A modern multispindle, multihead and multi-direction drilling machine is shown in Fig. 4. An advantage of this type of machine is that workpieces are located and clamped in a fixture just once. They are indexed into the various work stations without need for relocating or reclamping. This is especially valuable where rough part location points are used and multiple operations must be accurate in relation to each other.

Tapping machine quality has been steadily raised too. A highly productive semiautomatic tapping machine is illustrated in Fig. 5. This is an adjustable multispindle machine in which the spindles can be arranged to suit a particular workpiece. As many as 15 different types of parts, requiring as many setups, can be processed in one workday. The parts are small molded plastic telephone parts with brass inserts that must be tapped. An operator places a part in the fixture and progressively indexes it through the required number of stations to complete the tapping of several holes. Production rates up to 120 pieces per minute are not unusual.



drilling • reaming • tapping

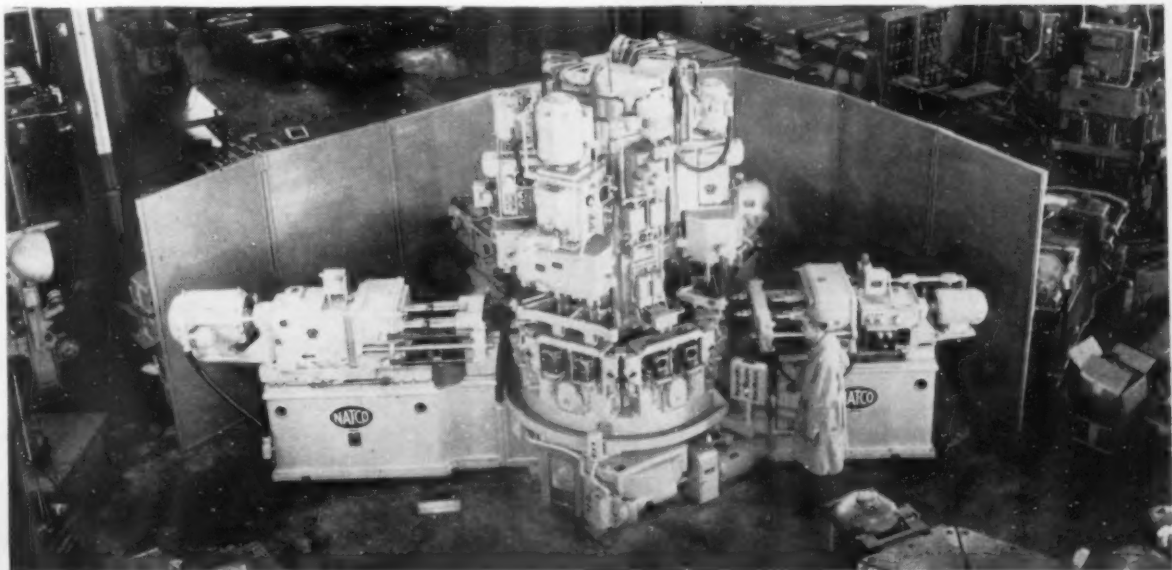
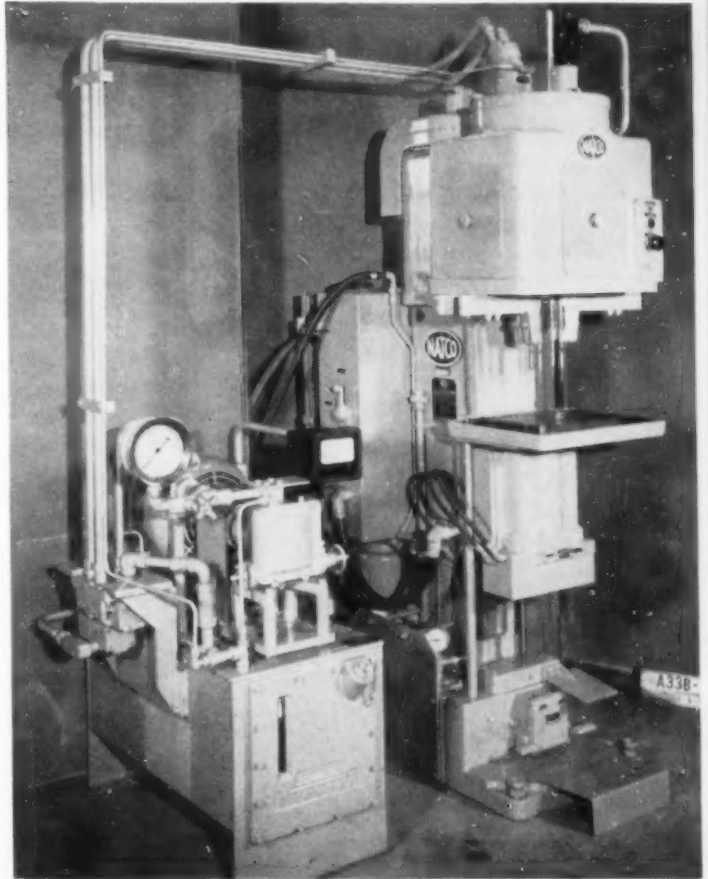
Fig. 3. (left) The air gage from the station shown in Fig. 2. Air probes on the back face measure the sizes of two reamed holes and their center distance.

Fig. 4. (bottom) A modern multispindle, multihead and multidirection drilling machine.

Fig. 5. (center) High-production semiautomatic tapping machine in which multiple spindles can be individually adjusted.

To meet this high rate, requires the reversal of taps at rates up to 240 reversals per minute. A variable volume hydraulic pump driving a fixed displacement hydraulic motor is used to obtain spindle speed flexibility, and a four-way valve is used to obtain the fast reverse. Moving components are held to a minimum to reduce fatigue failure under the severe reverses.

A single point self-guiding drill or reamer has long been used in gun-drilling operations. Such tools have not been used extensively previously but currently, some high-production parts are being drilled and reamed with single point tools of this character to obtain straight, round holes with excellent wall surface finish. Most of the holes so drilled or reamed are not considered deep. The method has been selected because of improvement in tool performance over previously used twist drills and multiblade reamers. More extensive use will be made of these single point tools as their full



value is realized.

Systematic control of tool changing is being used in many production departments with varying degrees of success. The method is predicated on tool life studies and mathematical laws of probability. Tools are changed at intervals set to achieve optimum economy among the factors of tool life, cost of refinishing tools, down time and spoiled work. Factors not always considered are variables such as variation in tool grinding, workpiece hardness and structure, quantity of stock to be removed, and machine variations such as speed and feed. Determining the success of such tool changing systems is not always easy.

The metal-cutting industry represents one field in which truly automatic control has been late in arriving. The speed, judgment and especially the flexibility with which a skilled mechanic controls his machine tool have been difficult to duplicate with automatic controls. New developments in automatic tape or card controlled mechanisms

using feedback control and machine computation are, however, now opening the door to automatization of machine tools to produce a variety of parts in relatively small quantities.

In the near future, production machines may operate completely automatically under the control of tapes or cards. Changing from one production part will be a simple matter, similar to changing a phonograph record. For every workpiece, there will be permanent records that can be used to control the necessary machines to produce the required part. There will be a separate tape or card for each control segment and a master tape will program the order in which individual production steps should be carried out.

Sound production knowledge and experience backed up by scientific understanding will continue to be prerequisites for machine tool engineering. If the trend toward automatic machine tools is followed, the idea of an automatic factory will grow step by step until eventually it will be a reality.

CIRCULAR SAWING

provides precision cutoff for automation

By G. E. Merryweather

Motch & Merryweather Machinery Co.
Cleveland, O.

CIRCULAR SAWING as a fast, economical means of cutting off machinable metals has become well established in metalworking plants. Now, it is taking its place in the automation field as an equal partner of various other machining processes, such as milling, drilling, tapping, reaming, and boring, *Fig. 1*. Circular sawing can provide the beginning of such an automatic process line and reduce costs by permitting utilization of less expensive standard bar stock.

The metalworking industry requires many shafts

for motors, pinions and various rotary mechanisms. To provide a good productive start for the varied operations, circular sawing heads perform labor and time-saving tasks by combining simple cut off operations with double-end machining. A typical automatic transfer machine designed to embody these advantages is shown in *Fig. 2*. In this type of machine, a circular saw cuts the material accurately to a square, milled finish length, while a simultaneous operation, such as boring, facing, chamfering, center drilling, turning or reaming,

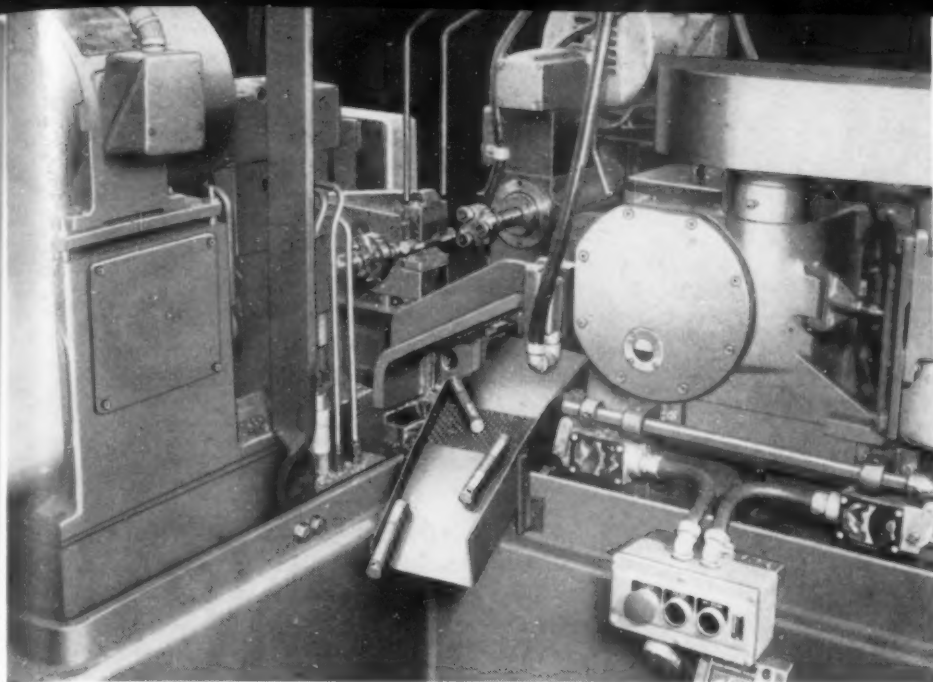


Fig. 1. Differential pinion shaft emerges from automatic transfer line after being cut off in circular sawing operation.

prepares the part for subsequent finishing operation.

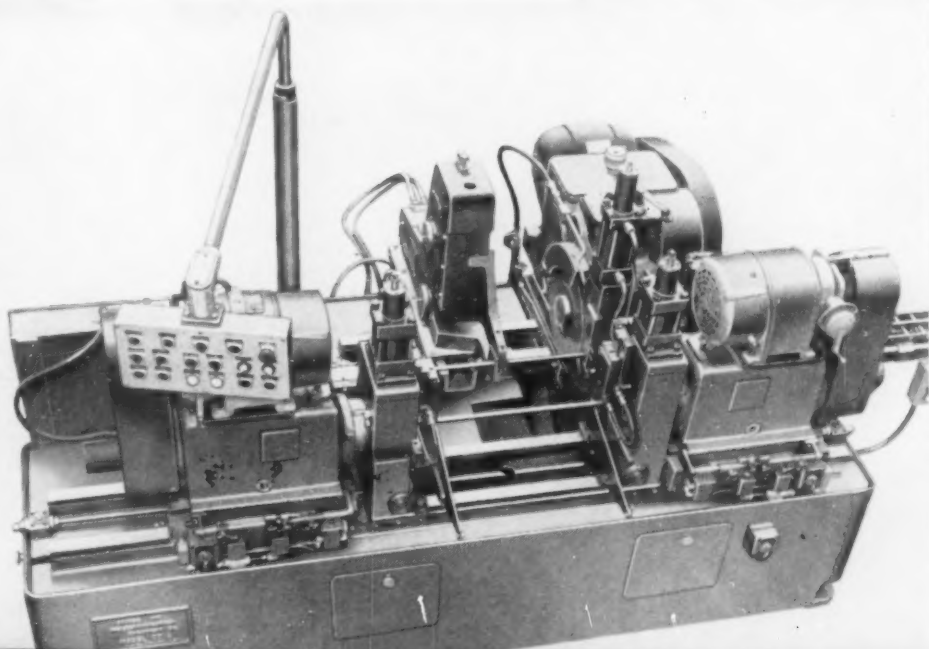
A variety of operations can be performed by this machine. For instance in a typical setup bar stock is automatically fed to a positive stop which is set for the desired length. The stock is clamped at the saw station as well as by a transfer arm during the sawing cycle. Upon completion of the cutoff operation, the transfer slide moves the piece to the double-end machining station and a new length of stock is fed to the cutoff station. At the double-end machining station, the transfer arm positions the cutoff piece in self-equalizing, centering jaws and returns to clamp the new length of stock that is being cut off. During the second cut-off operation, the secondary heads move forward and machine both ends of the first piece simultaneously. Upon completion, the jaws open and the finished piece is ejected to the front of the

machine or into a transfer mechanism.

By employing these principles a refrigerator manufacturer secured considerable savings on a cylinder head bracket. The needed part was designed so that it could be made from ordinary angle-iron stock. To process this material, standard machine components were linked together into a 15-station, in-line transfer machine, *Fig. 3*. The first station saws the angle iron to length so that three equal length pieces can be discharged at the final station. The saw unit discharges the piece into a lateral conveyor for loading into the main straight-line transfer machine. Layout of the operations is shown in *Fig. 4*.

At the first machining station, the angle-iron section is milled on one face and one edge. The part is then moved into a barrel type turnover fixture and from there to the second machining station for milling the other face and edge. At the

Fig. 2. Over-all view of automatic transfer machine which starts with cutting of workpieces to length from bar stock by circular saw, upper right.



MACHINE TOOL PROCESSES

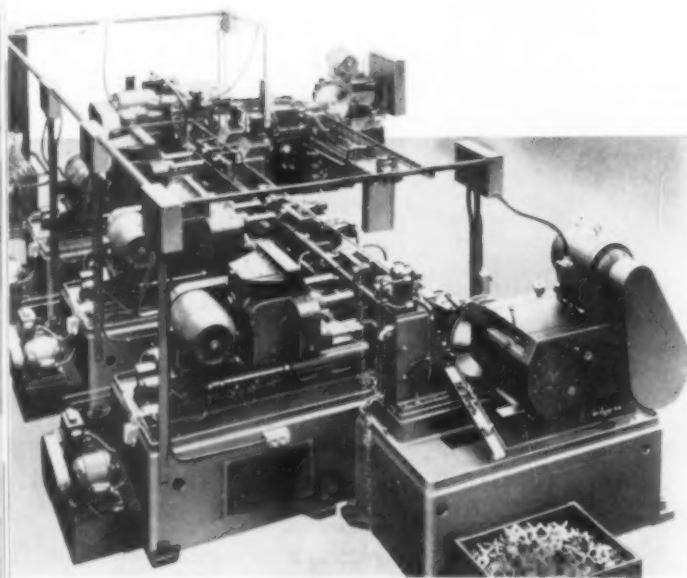


Fig. 3. Automatic transfer line, which produces 384 cylinder brackets per hour from angle-iron stock, begins and ends with circular sawing operations.

next station three holes are drilled and reamed. Next, twelve holes are drilled and six holes reamed on a similar setup. The drilling and reaming stations are followed by a second barrel type turnover fixture, which positions the part for end milling of seven holes. The milling, reaming and drilling stations are equipped with 15 hp, way-type power units with multiple-spindle heads. At the last station, a saw head, equipped with two circular saw blades, cuts the stock into three completed pieces.

The work is located and hydraulically clamped at each station. The bottom of the base is open for chip conveyor and coolant sump installation.

Another type of transfer machine, utilizing circular sawing is a compact unit, *Figs. 1 & 5*, designed to expedite production of automotive differential pinion shafts. In this case, most of the work of processing is completed prior to sawing it to length. Standard $\frac{7}{8}$ -inch round, cold-drawn stock is introduced into a hydraulic feeder where it is progressively moved in a straight line to the machining stations, as indicated in the schematic layout, *Fig. 5*.

At the first station, opposed drill units counter-sink the workpiece on both sides and at the next station, opposed drill units drill a hole from both sides. The bar stock is then indexed to two stations where flat notches are broached. At this point, the bar enters a second hydraulic feeding device that is synchronized with the initial one. Then the bar proceeds to the cutoff position and a standard circular sawing head parts the workpiece to the correct finished length. While the cutoff operation is being performed, a transfer arm advances to grip the cut piece, withdrawing it to the double-end chamfering position. On completion of this operation, the part is ejected by the forward motion of the transfer arm.

These case studies are but a few of many instances in which circular sawing is employed. Even standard circular sawing cutoff machines are now provided with automatic stock feeders, magazines, and automatic stock-handling devices. Because of its demonstrated adaptability to automation and automatic processes and its comparative cost advantage, increasing utilization of circular sawing may be expected.

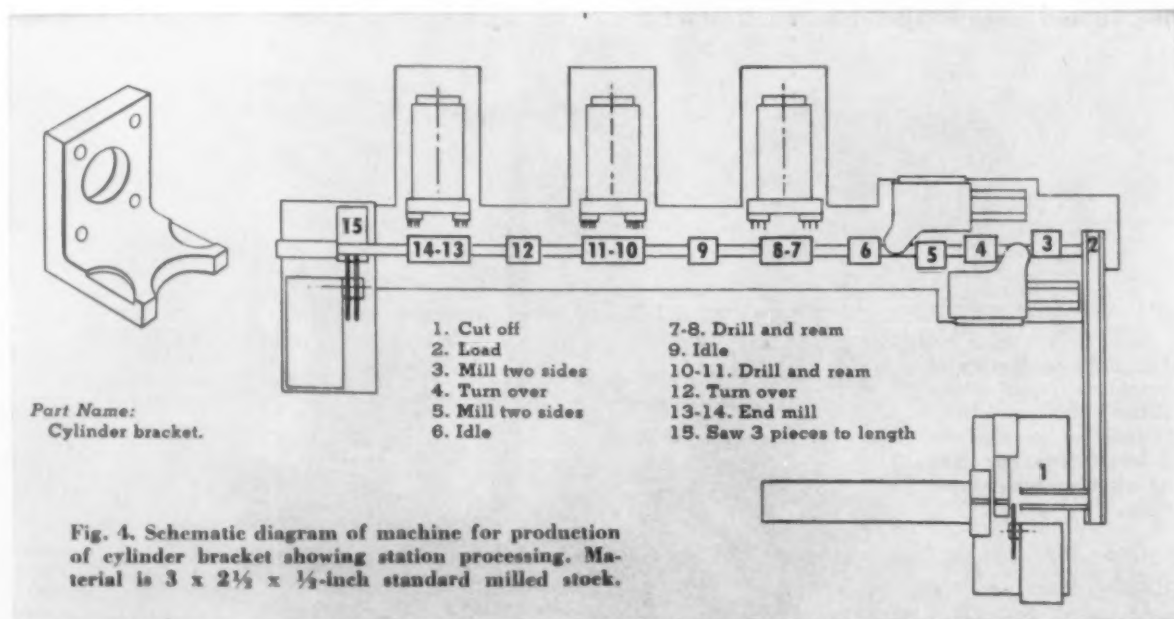
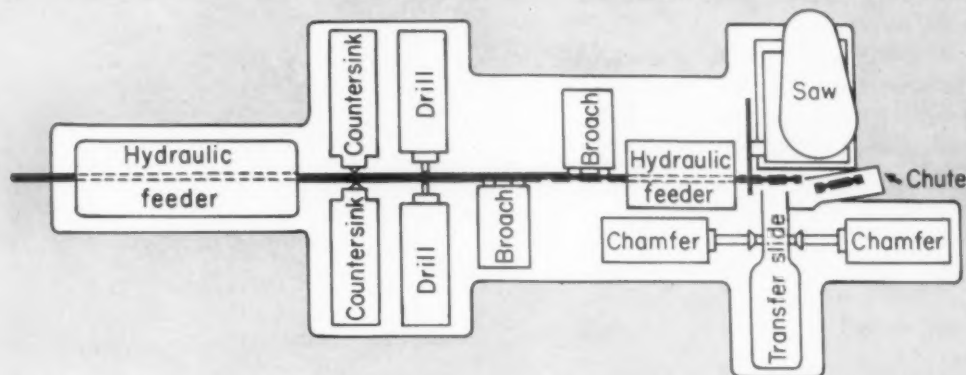


Fig. 5. Schematic drawing of differential pinion shaft setup showing stations and sequence of machining operations. Production is 300 pieces per hour at 100 percent efficiency.

circular sawing



GRINDING • LAPPING

quality improved with automatic equipment

By H. P. Chace
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Worcester, Mass.

RISING COSTS of materials and labor, and keen competition for manufactured products have stimulated an increasing demand for productive labor-saving machinery and devices. In the field of grinding and lapping, many advances have contributed materially to the goal of better products at lower costs. The most dramatic of the new grinding machine developments are, of course, the large machines designed for specific jobs. These machines generally operate automatically with high accuracy and output. However, general-purpose machines and grinding-machine auxiliaries are of interest and value too. Space limits discussion to a few typical examples, which will indicate the direction of

progress. The following illustrations are taken from that portion of this field which deals with external cylindrical grinding, tool grinding and mechanical lapping.

Transfer Type Grinder

An outstanding contribution to the field of cylindrical grinding is a completely automatic machine for grinding crankpins of automotive crankshafts (THE TOOL ENGINEER, April 1955, pp 94 and 95). This Norton transfer type crankpin grinder takes over all of the machine and operator functions of the operation in a continuous production cycle in-

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cluding: handling, locating in the machine, grinding, gaging, transferring from station-to-station and removing from the machine.

The machine is built in sections, *Fig. 1*, each base section mounting two independent grinding wheel slides carrying 42-inch diameter grinding wheels. The grinding wheels are individually driven from motors mounted on the wheel slides. Each section has a work drive motor delivering power to two pairs of work heads, with their work holders, through a common drive shaft. Crankshafts are automatically and accurately located both laterally and angularly before the hydraulically operated clamps are closed.

Automatic gages contact each crankpin as it is ground and control the size within prescribed tolerances by automatically terminating the wheel feed, when correct size is reached, causing the wheel to retract. Not until all the wheel slides are retracted can the work holders be stopped and the crankshaft released for transfer.

The transfer mechanism consists of a fabricated steel framework supporting an overhead track extending from the loading to the unloading conveyors. When all loaders, *Fig. 2*, have disposed of their crankshafts, they all move to the left to their original positions, completing the cycle.

Grinding wheel truing is also automatic and includes automatic wheel feed compensation equal to the amount of truing diamond advance. A counting mechanism can be set so that truing will occur automatically after a predetermined number of shafts have been ground.

Production rate for grinding all the crankpins on a crankshaft with this machine is comparable to

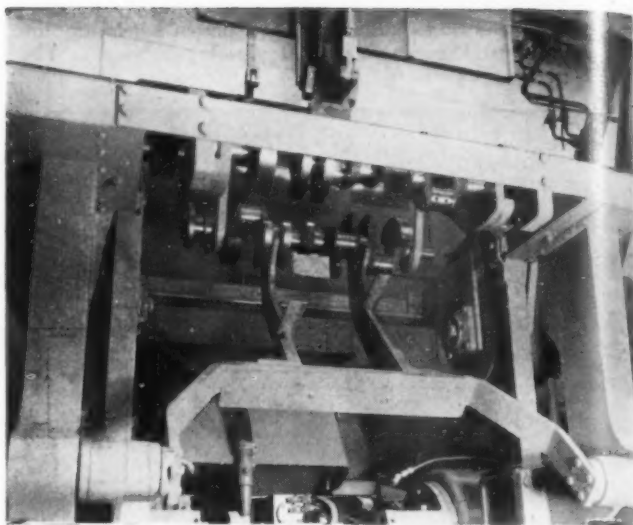


Fig. 2. Crankshafts in the transfer intermediate station. One crank has just been removed from the work holders and another is ready to be inserted.

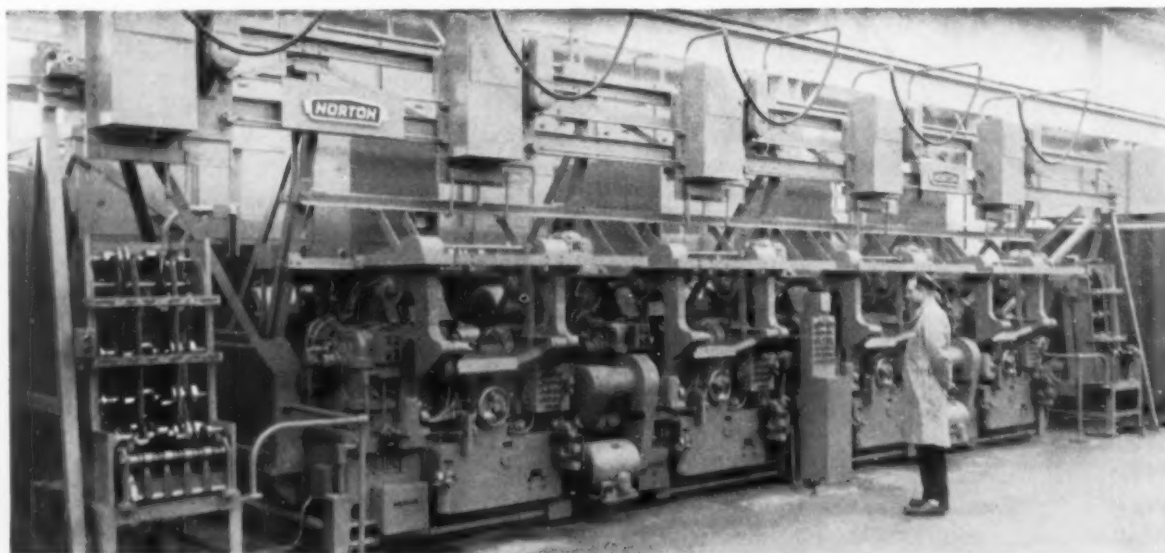
that obtained by an operator grinding a single crankpin in a conventional crankpin grinder. Work stations are preset to operate at a rate of about one V-8 shaft per minute.

Universal Piston Grinder

Truck engines use pistons of somewhat different design than those in passenger automobiles. These pistons are ground with a peculiar form of relief, elliptical in contour but having a different shape as well as a different amount of relief at the top and bottom of the piston skirt. This contour cannot be produced in standard piston grinders.

A special machine, known as a universal piston grinder has been developed to produce the complex form desired. This machine, however, is also able

Fig. 1. General front view of transfer type automotive crankpin grinder.



grinding • lapping

sections so that independent motions can be imparted at either end, controlled by the two master cams. The section of the bar that carries the footstock is integral with a shaft that runs the length of the unit and is controlled in its motion by the master cam nearest the work drive head. The other section of the rocking bar swings around this shaft on antifriction bearings, its motion being independently controlled by the master cam nearest to the piston, which is held in a fixture on the master cam spindle.

Wheel Truing

Much has been accomplished to improve equipment and methods for truing grinding wheels on cylindrical grinders. Truing efficiency is greatly increased by the use of hydraulically operated automatic devices, *Fig. 5*, which are mounted on the wheel guards and replace the manual operations and skill involved in conventional wheel truing.

Such truing devices are self-contained and operate independently of wheel slide or table movement. The truing diamond is positioned inside the wheel guard and mounted on a bar which is advanced by a mechanism on top of the wheel guard, its horizontal path of travel being guided by a form bar which may be either straight or shaped, *Fig. 6*.

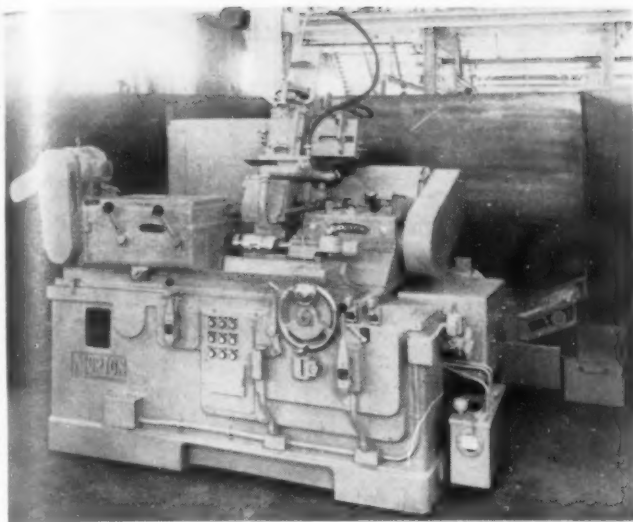
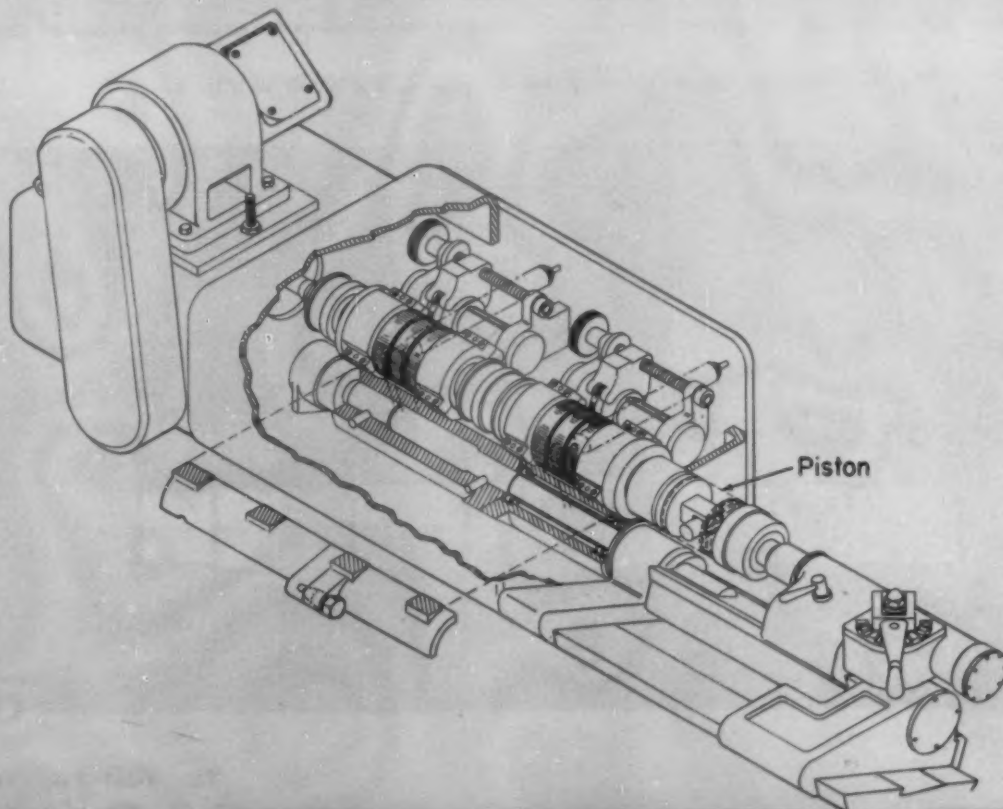


Fig. 3. Universal piston grinder set up for plunge-cut grinding on an automatic cycle. This unit has an individual coolant filter.

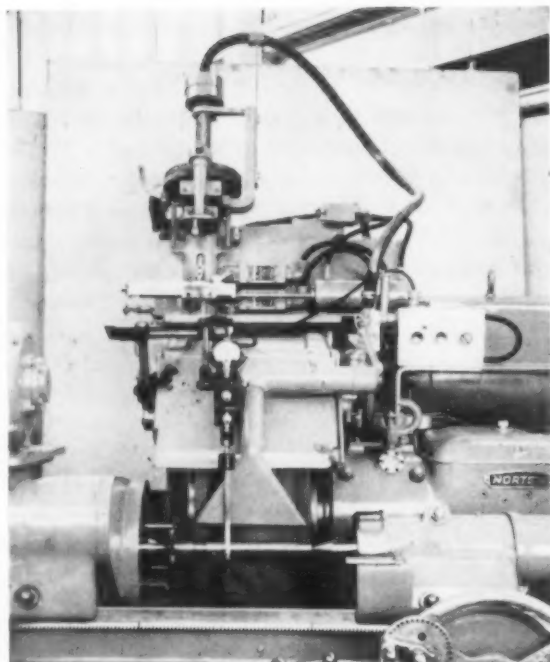
to grind more simple contours, elliptical in shape with either straight or tapered skirts. This universal piston grinder, arranged for plunge-cut grinding on automatic cycle, is shown in *Fig. 3*. The machine is also equipped with a wheel truing device mounted on the wheel guard.

Arrangement of the work drive and cam unit is shown in *Fig. 4*. It can be seen that the master cam spindle is made in two sections connected by a universal joint. The rocking bar is also in two

Fig. 4. Work drive and cam grinding unit of the universal piston grinder.



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Operation of the device is exceedingly simple. When a conveniently located button is depressed the truing cycle starts, traversing the diamond across the wheel face and back again at a pre-determined speed and feed. Normally, the diamond cuts in both directions. Automatic down feed of the diamond is adjustable in increments of 0.0005 inch.

Such truing devices are available for cylindrical grinders with capacities up to 10 inches of diamond traverse. They are particularly adaptable for wide



Fig. 5. (left) Wheel guard type truing device used on a cylindrical grinder. Seven diameters are required on the two wheels to grind main transmission shafts.

Fig. 7. (above) Tool grinder with its power supply unit used to diamond grind carbide tools with an electrolytic assist.

or multiple wheels and are especially helpful in truing wheels on angular wheel slide grinders where one face is trued at a right angle to the other. A special arrangement provides a vertical lift on the diamond when truing wheels with high shoulders.

Automatic wheel truing provides close control of the amount of abrasive removed from a wheel. The uniform feed and pressure result in longer life for both wheel and diamond as well as eliminating the need for effort and skill on the part of an operator.

Electrolytic Grinding

In order to conserve diamond bort, which at times has been in extremely short supply, Norton research has developed a practical method of grind-

Fig. 6. Configuration of grinding wheels used in the setup of Fig. 5.

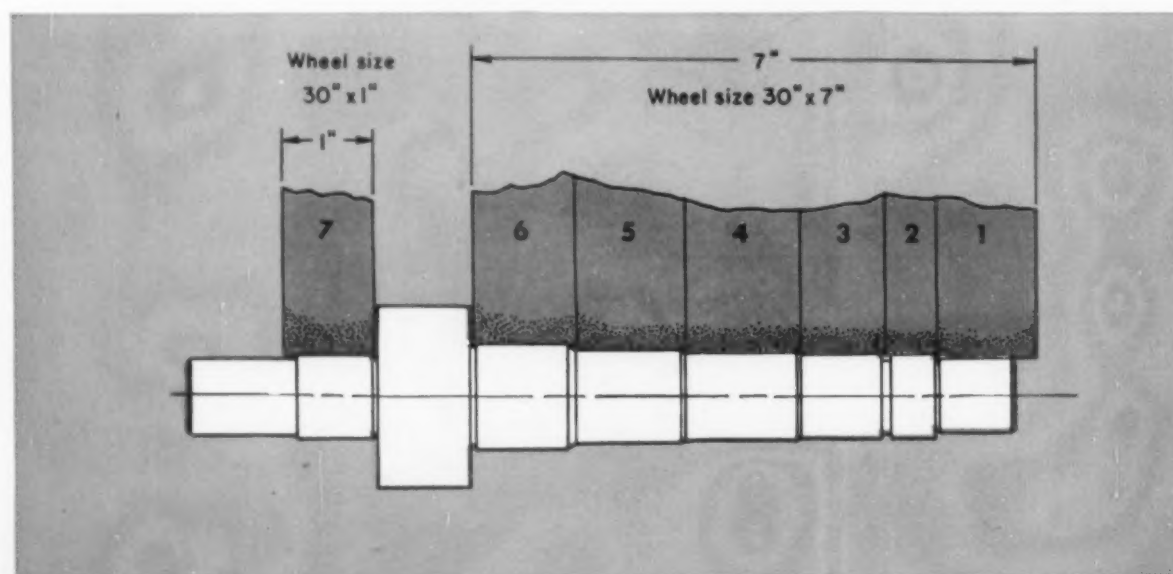




Fig. 8. Finishing a cemented carbide tool on a B-M abrasive belt using equipment developed in conjunction with Fenlind Engineering Co.

ing cemented carbide using electrolytic action to supplement the abrasive action of the diamond wheel, and a standard power supply unit for this purpose, *Fig. 7*.

This method utilizes a conventional metal-bonded diamond wheel which is assisted in removing stock by simultaneous electrochemical erosion of the carbide. The carbide tool, which is positive in a direct current electric circuit, is separated a minute amount from the metal bond of the diamond wheel, which is negative, and a suitable electrolyte flows between them. Diamond particles act both as an abrasive removing metal in the conventional manner and as effective nonconducting spacers to pre-

grinding • lapping

vent metal-to-metal contact between the carbide tool and the metallic bond of the diamond wheel during the electrolysis process.

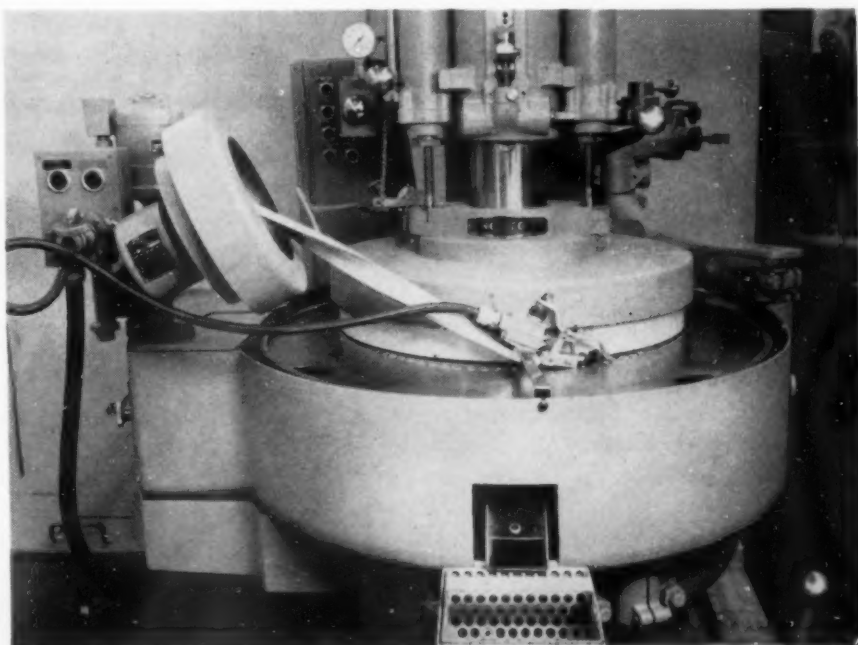
Low-voltage high-amperage direct current power is furnished from an alternating current circuit by the power supply unit. One side of the line is connected to the metal-bonded diamond wheel, mounted on a specially insulated grinder spindle through carbon brushes at the rear of the spindle. The other side is connected to the tool through the toolholder. Convenient adjustments from high to low current density are provided for roughing or finishing and for large or small areas of contact between wheel and work. This process results in a substantial reduction in diamond wheel costs since diamond particles do much less work than in conventional grinding.

Abrasive Belt Finishing

Superior, keen cutting edges can be produced on single-point carbide tools by a new method. Called "micro-finishing," the method uses lowcost abrasive belts. The tool is supported and positioned on the simple but ingenious fixture of a specially designed, relatively inexpensive machine, *Fig. 8*.

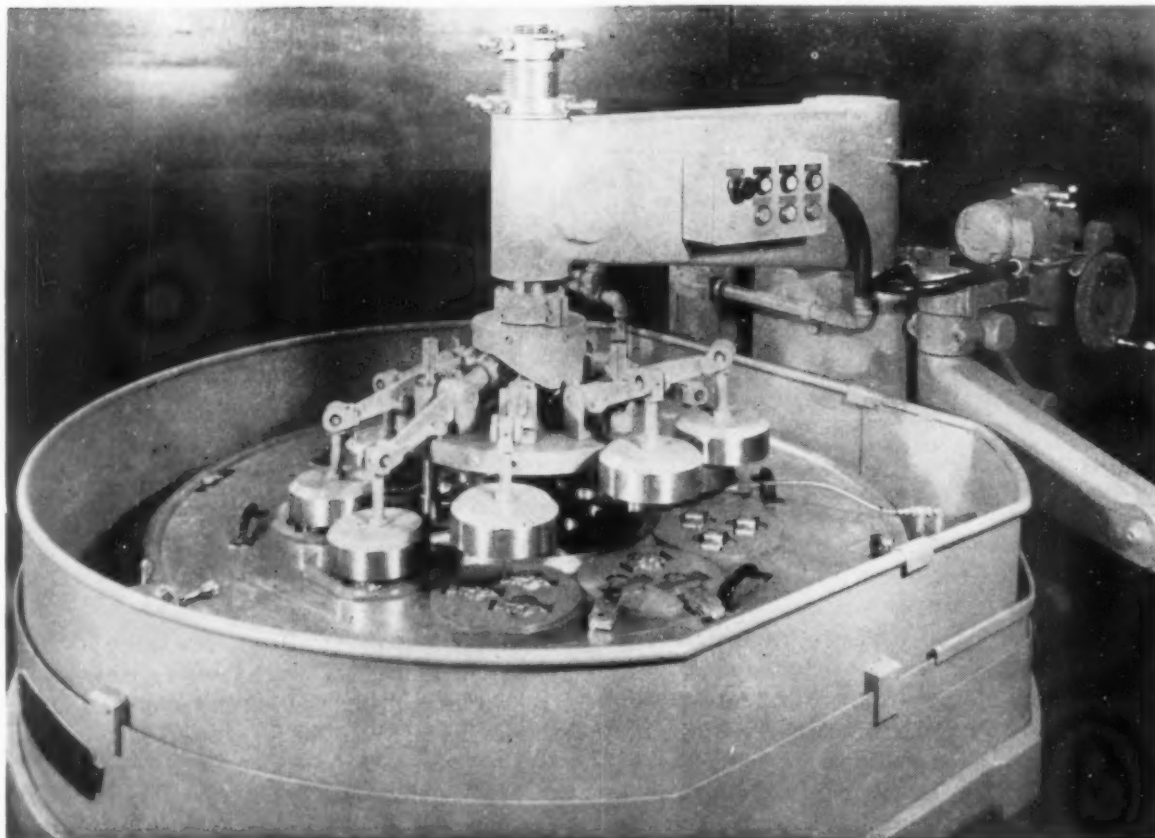
The operator finish grinds a primary relief land, generally $\frac{1}{32}$ to $\frac{1}{16}$ inch wide, below the cutting edge of the carbide tipped tool, which has previously been rough ground in the conventional manner on a silicon-carbide grinding wheel. Only a few passes of the tool across the coated abrasive belt are necessary to produce the narrow primary

Fig. 9. Small brass disks are placed in the rotating hopper of a lapping machine which delivers them in a single line through a feeding chute to a finger loading mechanism that guides them into empty spaces in the work holder. Both surfaces of the disks are lapped.



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Fig. 10. In another lapping operation, parts carried in work holder inserts are held in contact with the lap by weights that automatically lift for unloading and loading.



relief land which is usually about 3 deg less than the established rough-ground secondary relief angle.

Abrasive belts commonly used are 4 inches wide and 54 inches long in 150, 180 and 220-grit sizes of silicon-carbide. Grain particles are electrostatically deposited in an upright position on the belt and held by a synthetic bonding agent. Surface finish readings of about 3 microinches, rms, are obtained with the 220-grit belt. The fine finish and keen cutting edge produced by this method results in long tool life and good work finish, and avoids use of expensive diamond wheels and hones.

Continuous-Feed Lapping

Mechanical lapping in the past few years has become common to assure dimensional accuracy and surface finish subsequent to grinding operations. Most mechanical lapping is accomplished by loading a number of parts in a work holder which carries the pieces with a gyratory motion over the surface of a revolving lap or between such laps for the length of time required.

A new development, however, is finding many applications for the finishing of flat surfaces continuously. Parts are placed one at a time in the

lapping machine, either manually or mechanically, and caused to move in a spiral path once around and across the face of the lap or laps, *Fig. 9*. As the work holder revolves between the rotating bonded abrasive laps, the parts move in a path from the outer to the inner edges of the laps and out again to a point near the loading station where they drop through an opening in the loading plate to a discharge trough.

Another arrangement for lapping an oil seal surface on small transmission parts is shown in *Fig. 10*. Here, only a single face is to be finished and the lapping machine is equipped with but one bonded abrasive lap, 36 inches in diameter. The machine automatically applies weights to hold the parts in contact with the lap. These weights are carried on arms controlled by a cam which raises the weights as the loading station is approached, permitting removal and reloading. While in this particular instance the loading and unloading is manual, the operation is continuous. A high production rate and uniform product are secured.

Grinding and lapping are well established production processes, and continued development in equipment and methods is raising product quality while reducing costs.

GEAR CUTTING • FINISHING

productivity increased through mechanization

By F. W. Sinram

Lees-Bradner Co.
Cleveland, Ohio

INCREASED PRODUCTIVITY of new gear-cutting machines has reflected the rapidly rising use of gears, pinions and splines by all industries since World War II. Automobile manufacturers in particular have demanded greater gear production to meet their increased use of gears in cars and automatic transmissions. Their demands have directly influenced equipment design and resulted in design innovations.

Modern gear-cutting machines bear little resemblance to the machines of the 1920's, although many machines built during that period are still producing gears. As with the evolution of many machine tools, no particular date can be selected as the start of the change. Present machines stem from

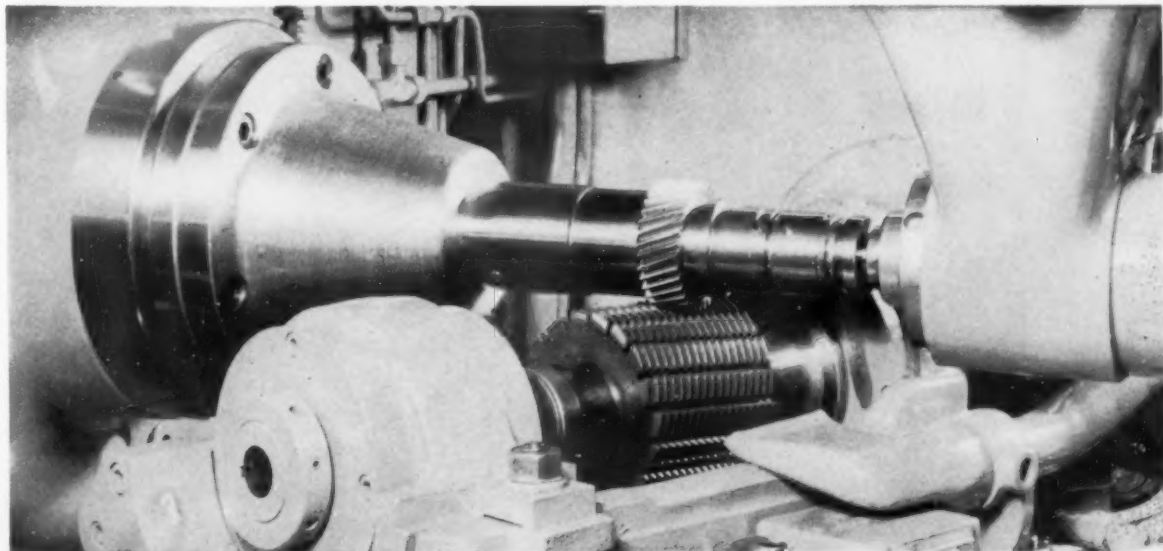
development work by all gear-cutting machine manufacturers to satisfy the requirements of customers and to maintain a new product in a competitive market.

Hobbing: Although climb hobbing has been used for years, a brief reference to it is apropos since it led to the introduction of high-speed hobbing. The most successful high-speed hobbing operations, *Fig. 1*, use climb cutting in such a manner that the cutting pressure is exerted against the tooling. Thus, rigidity of the tooling is an important factor.

Most modern hobbing machines can be arranged for climb or conventional hobbing in either direc-

Fig. 1. Close-up of high-speed hobbing on a hydraulic hobbing machine.

—Photo courtesy Barber-Colman Co.



MACHINE TOOL PROCESSES

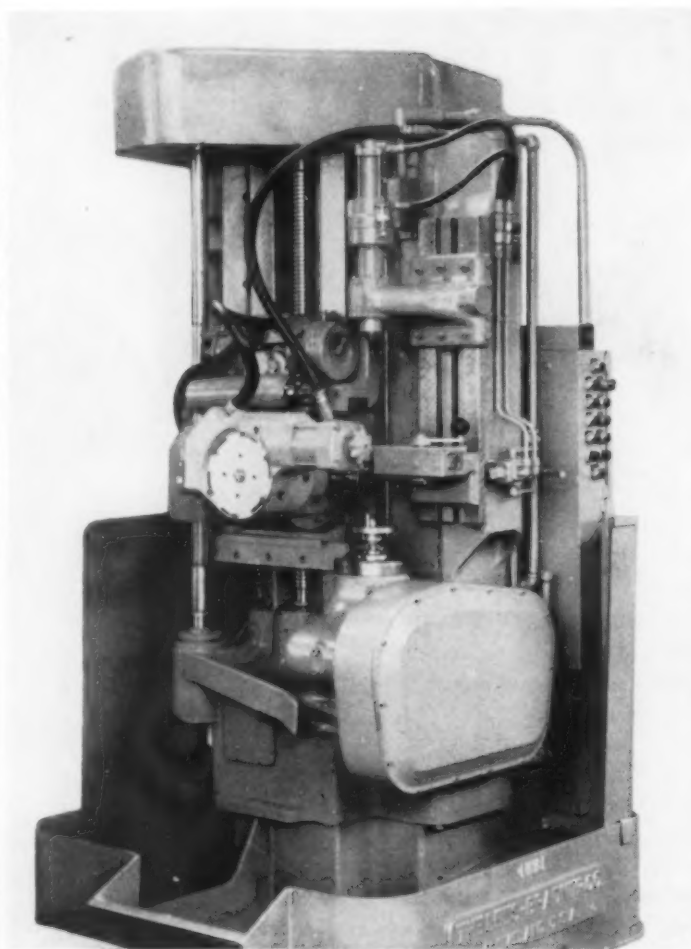
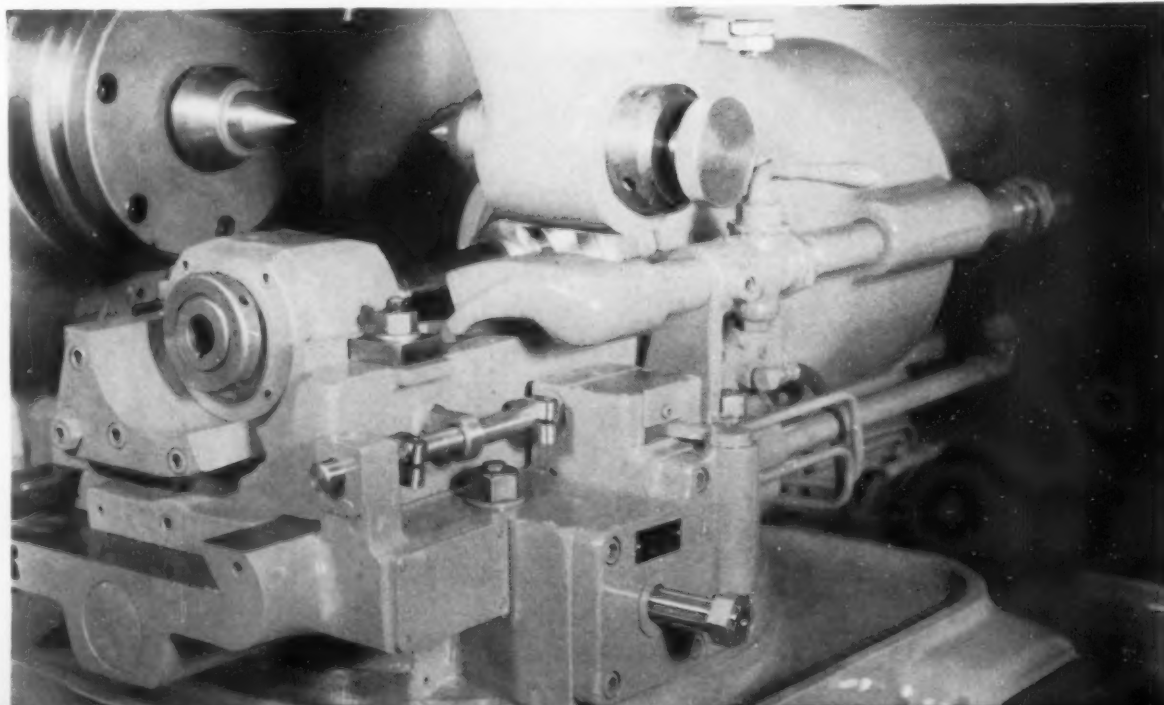


Fig. 2. Single-spindle heavy-duty production hobbing machine specially designed for high-speed production.

Fig. 3. Automatic hob shifter for the hydraulic gear hobber shown in Fig. 1.



tion. Selection of climb or conventional hobbing is usually based on the surface finish desired. In many instances, climb hobbing is replacing conventional hobbing because a better finish is obtained with equivalent hob life and part accuracy.

High-speed hobbing is a process in which greatly increased hob speeds are used. Frequently, but not necessarily, feeds are also increased. A hob speed, with high-speed hobs, of 300 sfpm constitutes high-speed hobbing. Remarkable savings in production time, up to 66 $\frac{2}{3}$ percent, have been reported as a result of simply increasing the hob speed. Frequently, hob life is extended when the higher hob speeds are used. In some instances, hob life has made a double transition as hob speeds have been increased. Initially, the number of pieces hobbled between regrinds was reduced as hob speed increased. As the hob speed was further increased, pieces obtained between regrinds increased to a number greater than that obtained before speeds were raised.

Many hobbing machines now in use are not designed to operate for any length of time under the conditions imposed by high-speed hobbing. However, the growing application of high-speed hobbing has brought about the development of high-speed hobbing machines.

Basically, a machine for high-speed hobbing must be heavier and more rigid. Development of such machines, however, entails much more than just increasing the weight of the various machine components. Higher hob speeds necessitate a reduction in backgearing to minimize the amount of gearing that must be run at high speeds. When backgearing is reduced, a backlash eliminator must be introduced in the design. Machines incorporating these design changes are shown in Figs. 1 and 2.

Proper hob shifting has a definite bearing on the

—Photo courtesy Barber-Colman Co.

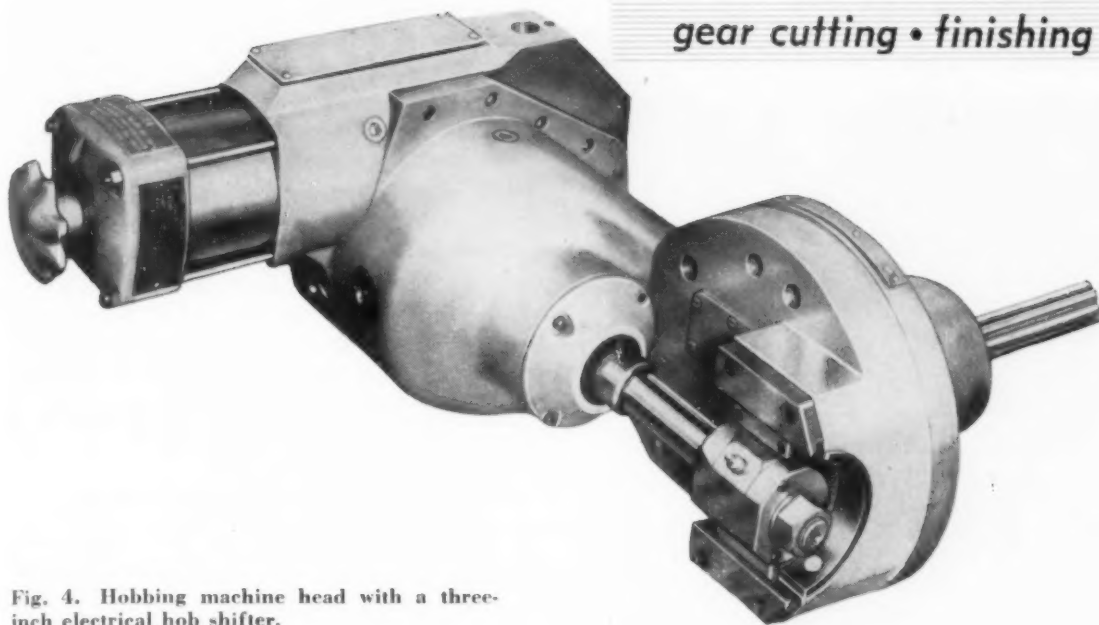


Fig. 4. Hobbing machine head with a three-inch electrical hob shifter.

life of a hob. The purpose of shifting is to uniformly distribute the wear. Shifting the hob places each tooth in several locations relative to the part and a large portion of the cutting edge of each tooth is used. All modern gear hobbers have shifting mechanisms of some type. Most machines can be set up for either manual or automatic shifting of the hob. Manual shifting is used when locating the hob in reference to the workpiece and on short runs, automatic shifting is preferable for production work.

Among the types of shifts available are: the continuous shift, in which the hob constantly shifts in almost immeasurable increments; the automatic shift, which takes place at the end of each hobbing cycle, and preset count switching, which takes place after the completion of a predetermined number of hobbing cycles. A recently announced mechanism electrically shifts the hob when an inspection device connected with the machine determines that the hob has worn sufficiently to warrant a shift. The inspection device checks the root fillet build-up of the gear. Typical hob shifts are shown in Figs. 3 and 4.

Problems of cycling and feeding have been solved in different ways by each machine manufacturer. These features are of greater importance with the advent of pitch diameter control at the machine. Mechanical, hydraulic, electromechanical and other hob feeds are in common use. All have been designed to increase productivity. Some of the mechanisms used to achieve proper hob depth, feed and withdrawal are unusual. One feature which many users consider a necessity on in-out mechanisms is a simple adjustment for different diameters and for slight variations in hob size. Without such an

adjustment, the machine cannot be set by a checking device to give the required pitch diameter.

Although gear checking and gaging equipment has been available for years, checking of the gears at the machine and adjusting the machine to correct for errors detected is a fairly recent concept. Devices for checking gears, particularly pitch diameters, are now offered by several gear machine builders. More recently, considerable effort has been expended in developing an automatic means for adjusting the machine to correct for errors detected during inspection.

As a result of the investigations into combining checking and controlling functions, some interesting developments have been made. One production gear-hobbing machine, for example, is equipped with "Auto-Motion," Fig. 5. This machine not only automatically loads and unloads but, by means of a checker and feedback unit, Fig. 6, adjusts the machine for pitch diameter control, signals the machine for a shift of the hob when the gear root fillet indicates one is necessary and sorts the finished gears.

Checking the gears at the machine and adjusting the machine for errors as they develop means less scrap and increased hob life. Operation of the machine is simple because control is positive and simple. For the present, this type of checking is adaptable only to production runs because of the checking equipment expenses that must be absorbed.

Automatic Loading: Automatic loading and unloading is not brand new on gear producing machinery. In 1949, the Gleason Works featured a No. 2 Hypoid Generator equipped with an auto-

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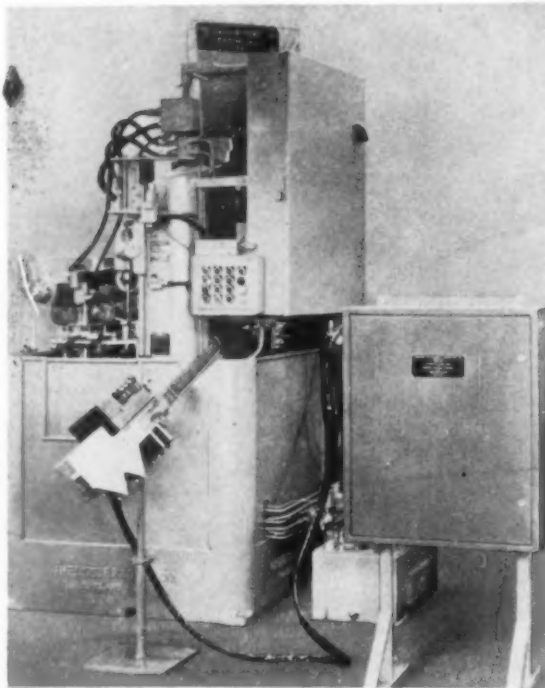


Fig. 5. Gear hobber equipped with self-loading and unloading equipment, form checkers for pitch diameter control and electrical hob shifting.

matic loader to provide continuous production. This device consisted of five equally spaced pick-up arms rotating about a horizontal axis and timed to a circular work holding table rotating in the horizontal plane.

The widespread use of work transfer in production processes has naturally resulted in integrating gear producing machines, equipped with self-loading and unloading devices, into production lines. The types of loading devices vary to suit the job and the machine. Among such devices are: shuttle arms, air or hydraulically actuated arms, vibratory feeders, chutes, magazines and combinations. In most of the arrangements dependent on vibration, no vibrations take place during the cutting portion of the cycle.

Automatic loading and unloading increases production and assures safety. Dangers of physical injury to an operator, ever present with manual loading, are drastically reduced. However, the costly capital outlay necessary for automatic loading equipment precludes its application to short runs even in large plants.

Generating and Shaping: Improvements and developments in gear generators and shapers have been as numerous and as extensive as in hobbing machines. Such improvements as easier selection of speeds and feeds are common in most machines.

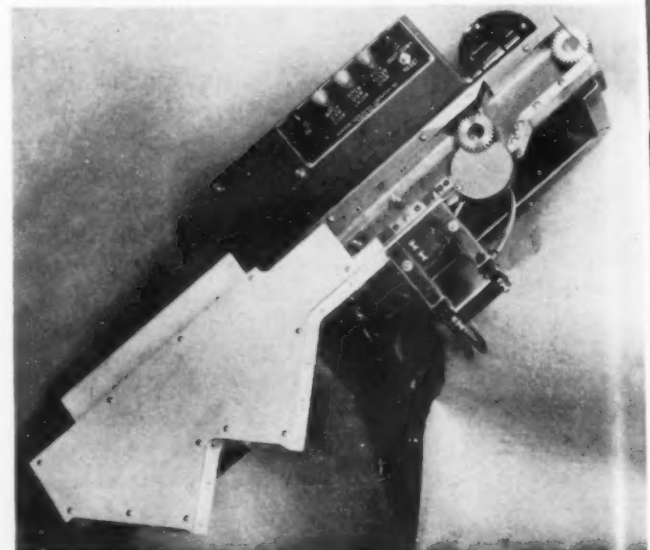
Positive control of infeed or depth of cut, easy adjustment of cutters, and improved though varied types of drives for rotary feed of cutters and work are available on gear generators.

Greater accuracy, more productivity and simpler operation of shapers are the result of improvements and developments in the postwar period. Application of modern shapers to unusual jobs is currently resulting in close-tolerance work not previously possible. Another trend is toward heavier machines capable of handling heavier workpieces. Generators and shapers are being fitted into production lines through the application of automatic loading and unloading devices. This is especially true in the automobile industry.

Shaving: As with other gear-producing machinery, shaving equipment has been greatly improved since World War II. Machine manufacturers have added features that greatly increase productive capacity. As a result of wide application and general acceptance, shaving has taken a definite place in the manufacture of gears. Shaving, as now generally accepted, is the correction or finishing of the surface of a gear by removing a limited amount of metal. The process is not the panacea that some believed it to be when it was first introduced. In order to keep the cost of shaving cutters within reason, the tooth profile must be accurately produced by the cutter or hob. Correction of profile errors with shaving equipment can become costly.

Shaving machines are available with various types of feeders and discharge arrangements. Some of the newer machines feed, shave, gage, sort and discharge automatically. Their place in high production lines is obvious.

Fig. 6. Inspection device used with Auto-Motion production gear hobber for checking pitch diameter and root fillet.



Cold Rolling: Much development work has been done in the field of cold rolling. So far, the most successful application has been in the rolling of teeth on spline shafts. Although the number of cold-rolling installations is at present limited, possibilities of economically producing teeth in this manner have been definitely proved. Much has been learned about the process but it is still in its infancy.

Problems encountered in cold rolling toothed forms are different from those normally met when producing a gear tooth with a cutter or hob. In addition to the problems of producing teeth to the

gear cutting • finishing

accuracy desired, problems of metal displacement are involved. Numerous tests on completed forms indicate that no detrimental effects result from the cold-working of metal in the production of a tooth.

Each user of gear producing equipment benefits from any new machine design. Each improvement in function and operation of a single machine spurs all equipment manufacturers to match or better the new performance with their own machines.

MECHANICAL PRESSES

influence of their design on production

By C. J. Linduska

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IN VIEW OF THE FACT that many mass produced products can be most efficiently produced on presses, it is only natural that the press manufacturers have developed equipment such as illustrated in Fig. 1 to produce more parts per minute with a minimum of down time.

The first step in this speed-up of production was to design clutches capable of withstanding considerably greater single stroking operations than had been previously possible without sacrificing life of the clutch. Fig. 2 shows the Clearing Tornado clutch which was one of the first low-inertia clutches for this application. Weight of the parts rotating at high speed which are necessary to start and stop at each cycle of the press has been reduced by approximately 70 percent over previous designs. This not only reduces the heat generated at each engagement but conserves horsepower for more useful work while the stamping is being drawn.

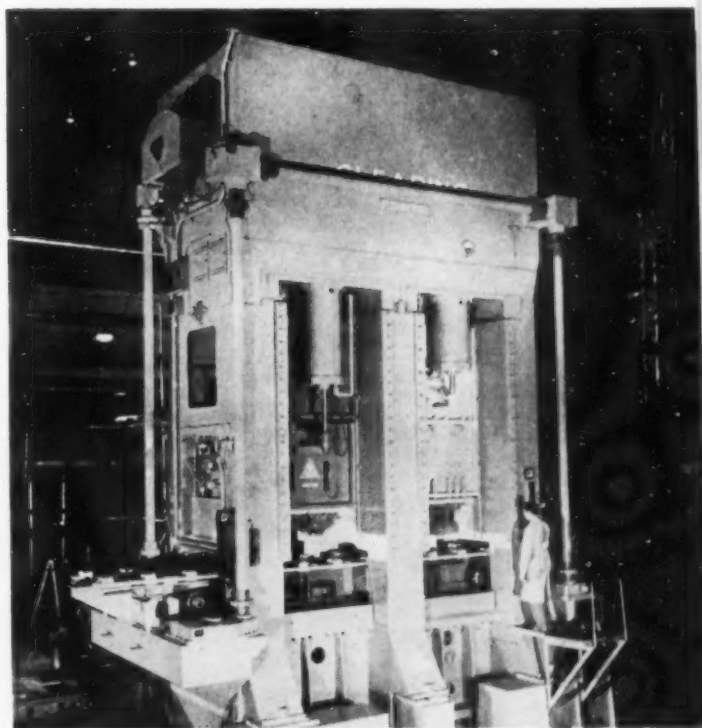


Fig. 1. Transfer feed press has two slides and skip stroke on second slide so that identical half shells are produced except alternate shells have larger flanges to provide for welding halves together.

MACHINE TOOL PROCESSES

The second advantage of this type clutch is its simplified maintenance. Adjustment for wear of linings can be made in a much shorter time and when necessary the clutch and brake lining segments can be fully replaced in less than an hour without the use of crane facilities.

The second step to increase production was the development of a built-in foolproof lubricating system. Fig. 3 indicates the lubricating system developed by Danly Machine Specialties. It can be well understood that good lubrication is mandatory to keep equipment running. Any serious bearing failure could cause an untold loss of production and headaches. Fig. 4 indicates the Danly signal block which will indicate which bearing is not getting lubrication. Should a failure occur in the lubricating system the press would automatically stop until the fault is corrected.

The third step by manufacturers in attempting to speed up production processes may seem to be a rather ambiguous one. It is, however, a well-known fact that most machine operators will be more content and get more production from a machine if it is of a streamlined totally enclosed design. Figs. 5, 6 and 7 indicate some of the most recent equipment being furnished with all electrical and pneumatic equipment enclosed for a smooth, clean appearance. This approach also eliminates

the danger of a lift truck or crane damaging air or electrical controls.

Probably the greatest factor to overcome in the effort to increase productivity is the characteristics of the material used. It is a generally accepted fact that steel should not be drawn at speeds in excess of 60 fpm. Although this is being exceeded in many instances, it is probably done at a sacrifice

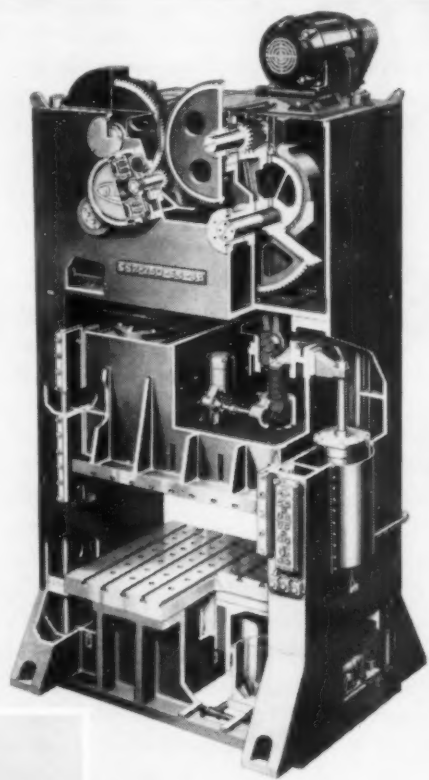


Fig. 3. Cutaway view of a Danly straight side press, showing in color automatic lubrication metered to each gear, bearing and connection of the crown and slide.

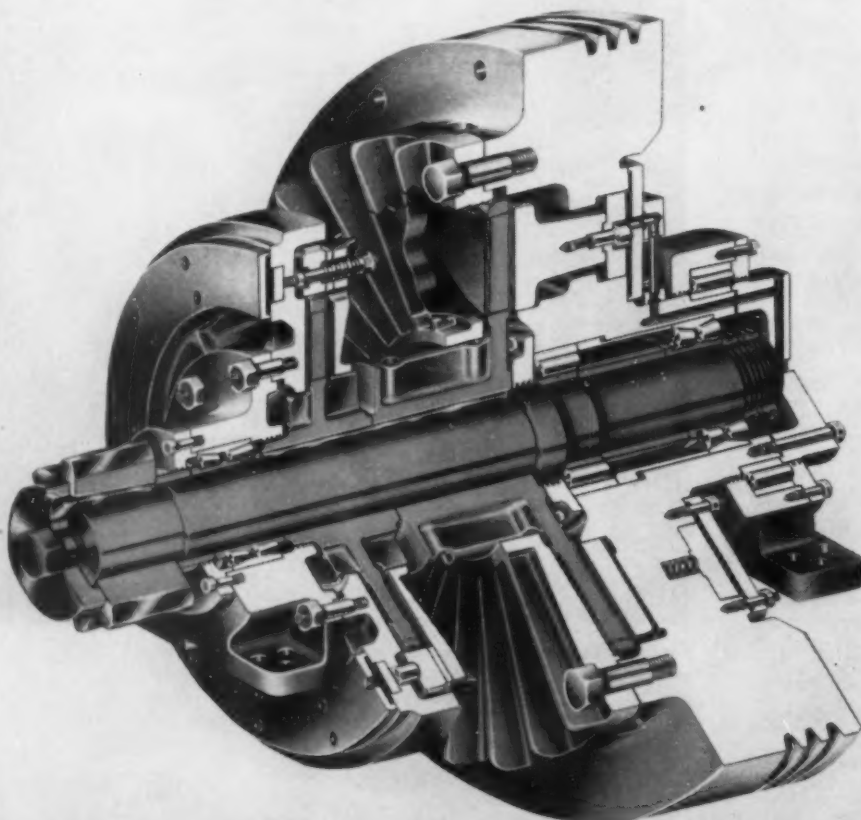


Fig. 2. Low inertia clutch and brake. Colored elements indicate the relatively small mass of the parts that start and stop during press cycling.

mechanical presses



Fig. 4. Oil-pressure safety switches stop the press in event of lubrication failure to any vital bearing. A signal in window indicates faulty line.

of die life. The press manufacturers approached this problem by increasing the press speed during the idle portion of the stroke, which, in most cases, is at least 80 percent of the elapsed time of each stroke.

It would only seem natural then that if this time could be decreased and the speed through the work held to the maximum, an increase in pieces per minute could be attained. This was approached basically in two ways. One by mechanical linkage which would make the inner and outer slides approach at high speed, slow down through the draw portion and return at high speeds. This results in a 60 percent increase in productive capacity of presses. In other words, a conventional press operating at 5 strokes per minute could give 8 strokes per minute without increasing the slide speed through the work portion of the stroke.

Another approach to this has been by the use of an eddy-current clutch and a special electronic control to regulate slippage of the clutch during the draw portion of the stroke. This, however, is a rather delicate presetting operation inasmuch as the clutch will attempt to return to synchronous speed and only the work in the press will restrict this return to high speed. Characteristics of the metal worked may vary to such an extent that the proper slowdown will not be achieved. This could result in the production of rejects.

The latest development in increasing press speeds mechanically is the Clearing Clearomatic clutch and brake unit, Fig. 8. Using a planetary gear arrangement, a positive predetermined speed of the slide can be calculated. On long stroke presses, the

speeds over conventional presses can be doubled yet have the proper draw speed during the draw portion of the cycle.

Automation—the magic word coined by a large automotive manufacturer—is the most recent development in the use of presses in the industries of mass production. The press builders had answered the problem of the manufacturers insofar as increasing production capacities of presses but had gone to the point where it was practically impossible to hand feed the equipment. Although automation is a comparatively new word, it should be realized that, if its principles had not been originally applied to the steel industry, there probably would not be sufficient steel to satisfy present demands.

Probably the oldest press method of automation is the use of progressive dies. In this type of product manufacture, a die is designed which progressively works the part while the material is fed to the press from coil or strip stock with a roll or hitch feed. Fig. 9 indicates an operation of this type with Fig. 10 showing the progressive steps and the final part.

The next step in automation of press equipment was the transfer feed press. Figs. 1 and 11 indicate presses of this type. In these machines, generally, blanks are fed to the first station and then feed

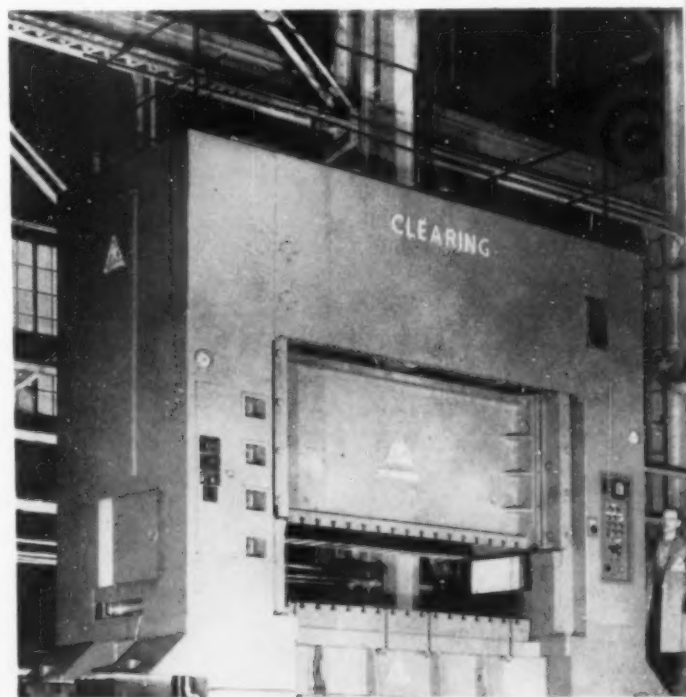


Fig. 5. Streamlined underdrive press showing enclosed construction. It has recessed control panel, pneumatic controls, and auxiliary outlets.

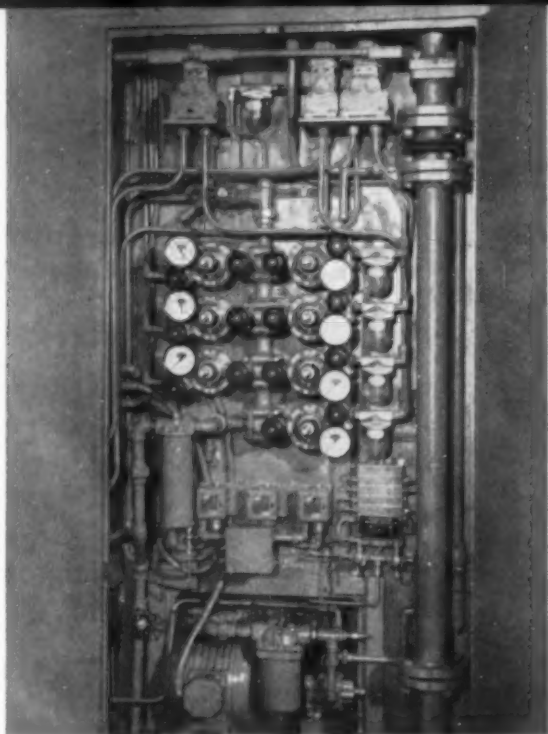


Fig. 6. Enclosure in Danly press upright contains all pneumatic equipment, lubrication pump and filter unit. Also included are lines for press functions and automation outlets for such units as feeders, unloaders, compound spray and die kickers.

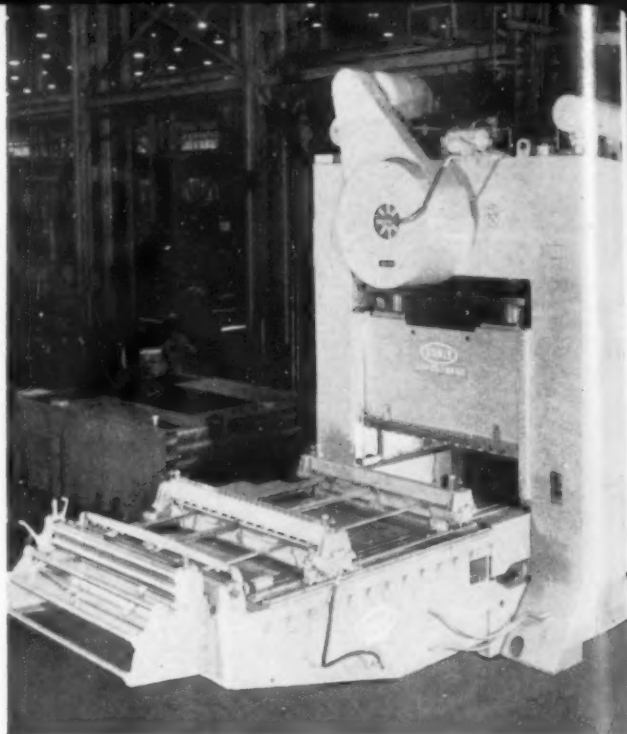
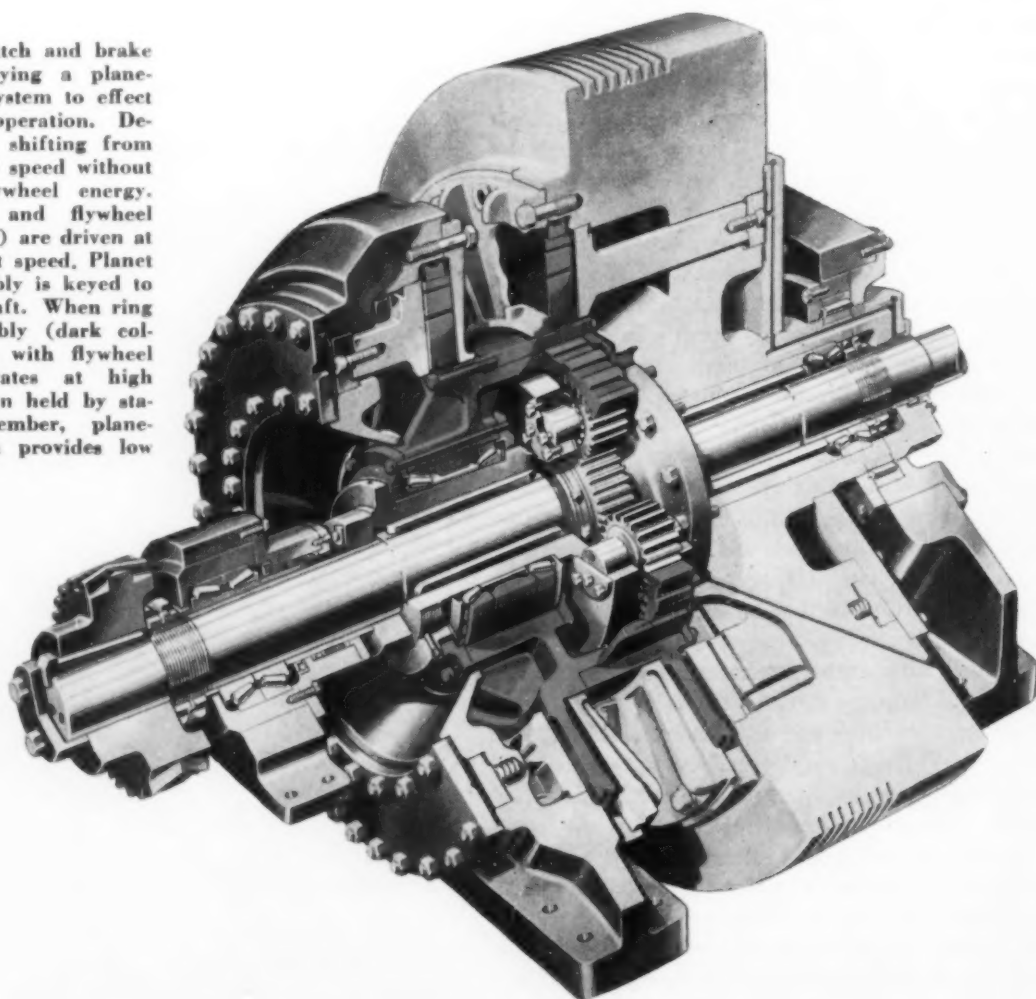


Fig. 7. Enclosed design of Danly press includes built-in pneumatic and electric controls. Large grip feed is driven through press frame. All driving mechanism is enclosed.

Fig. 8. Clutch and brake unit employing a planetary gear system to effect two-speed operation. Design allows shifting from high to low speed without loss of flywheel energy. Sun gear and flywheel (light color) are driven at constant speed. Planet gear assembly is keyed to the driveshaft. When ring gear assembly (dark color) rotates with flywheel press operates at high speed. When held by stationary member, planetary system provides low speed.



mechanical presses

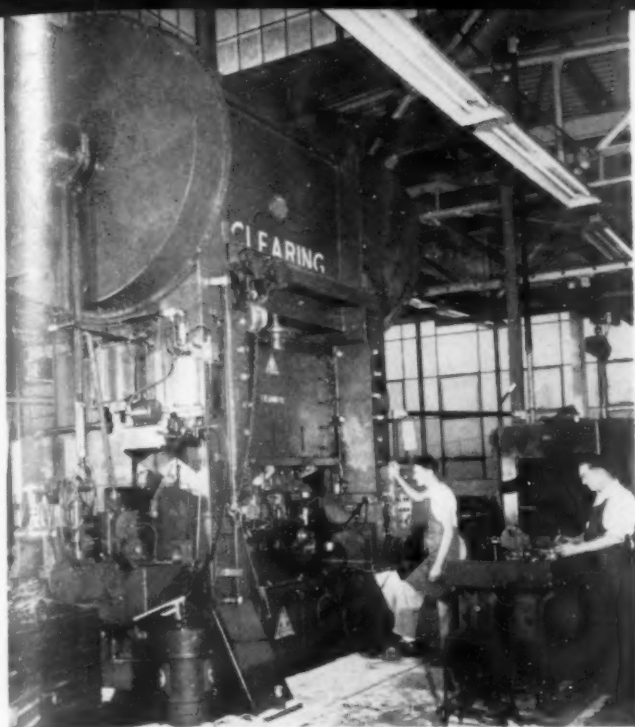


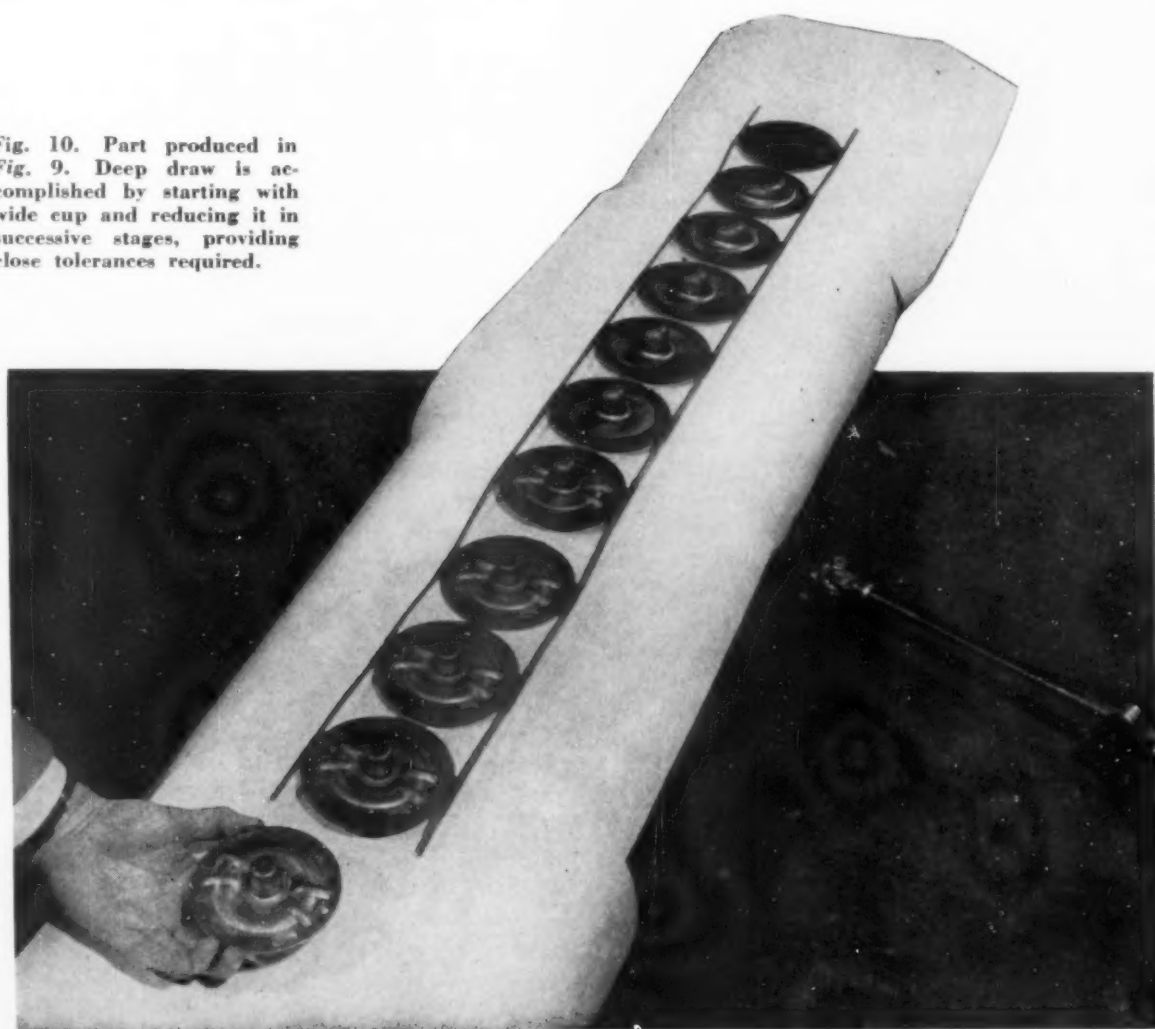
Fig. 9. Progressive die operation. Coil strip is fed from cradle and straightener at right through a roll feed. Outgoing roll feeds scrap cutter at right.

fingers pick up and carry the part from station to station until completed. Machines of this type are commonly used on medium-sized parts requiring roughly a movement of at least 10 inches from station to station. In smaller parts it is possible to buy die equipment which can have the transfer mechanism built into the die.

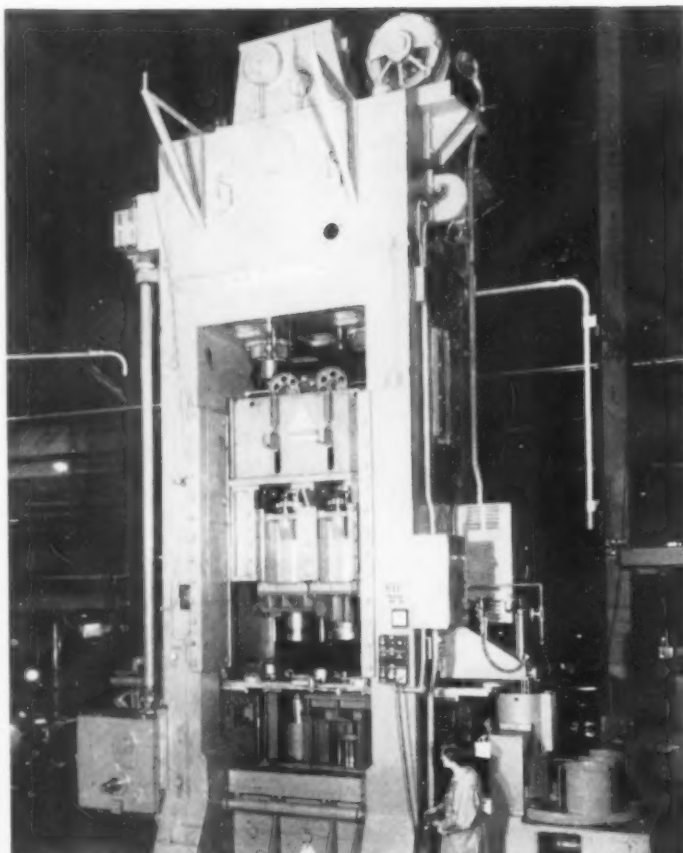
On large stampings, as used in the automotive industry, the trend is to mechanical handling from press to press. Equipment of this kind, however, is complex and, in general, has been designed by the product manufacturer to suit his conditions. Several lines of presses making parts such as roof tops which require 5 to 6 presses are operated by only one man at the lead draw press by feeding sheets into the loading mechanism. From there on to the final press operation the part is handled mechanically from press to press.

One of the simplest devices for medium or large

Fig. 10. Part produced in Fig. 9. Deep draw is accomplished by starting with wide cup and reducing it in successive stages, providing close tolerances required.



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stampings would be the application of a mechanical arm to extract the stamping from the die. This not only can eliminate an operator but is a definite safety measure.

A special press is shown in *Fig. 12* designed to bend flat stock edgewise, preforming it into a blank necessary to form a chassis frame member. This 1000-ton press illustrates a new approach to the production of automotive frame sections. The press has an unusual slide action and automatic feed which simplify the forming operation, speed material handling and conserve material.

An irregular shaped blank, $\frac{1}{8}$ inch thick by 10 inches wide and 210 inches long is required to form the automotive frame section shown in *Fig. 13*. If these were blanked to shape from sheet stock, there would be a considerable loss of material.

The conventional method of edgewise bending flat stock has always presented a problem of buckling. To solve this difficulty the press has an unusual slide motion and an appropriate feeding

Fig. 13. Action of press in *Fig. 12* to edge-bend stock without buckling.

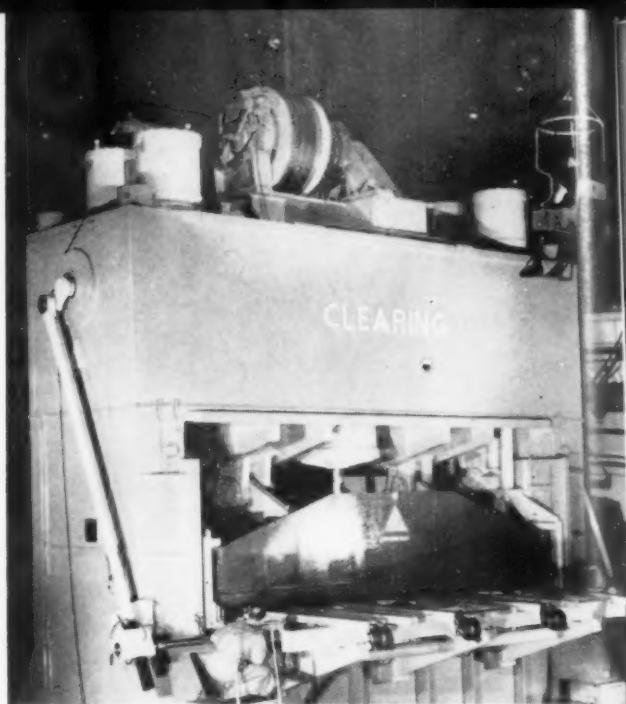


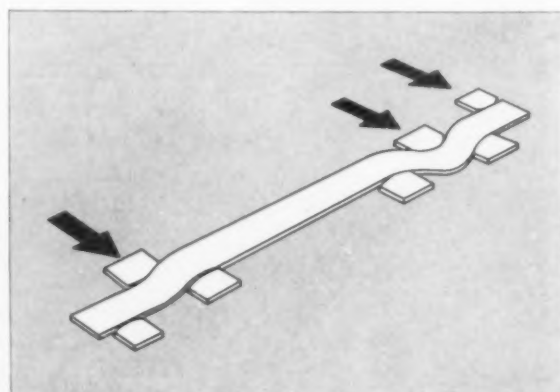
Fig. 11. (left) Two work station, transfer-feed press which is hopper fed from three stacks, the hoppers indexing automatically. After being lifted, part is grasped by fingers and is passed through two idle stations into dies. Feed mechanism consists of two bars with fingers mounted to them to grasp, move and release the work.

Fig. 12. (above) Special press has forward and backward action of slide to edge-bend flat stock. Press operates at 17 strokes per minute.

mechanism. The buckling problem was eliminated by the use of large air cylinders with 150 tons of hold-down pressure. The drive linkage strokes the slide forward and backward, applying a 750-ton forming force horizontally.

The feed mechanism uses both positioning fingers and electromagnets to grip and feed the stock through the press.

These applications indicate the versatility and potentialities of pressworking in solving everyday production problems. As new problems arise, they undoubtedly will be solved by utilizing the experience gained in past applications.



HYDRAULIC PRESSES

higher capacities and speeds increase production

By H. L. Reynolds

Vice President
Verson Allsteel Press Co.
Chicago, Ill.

NEW DEVELOPMENTS in the hydraulic industry have been brought about by the almost universal demand for more production with less man-hours. This demand for more production has resulted in the development of hydraulic presses to the point where they equal or excel the production of mechanical presses on many jobs.

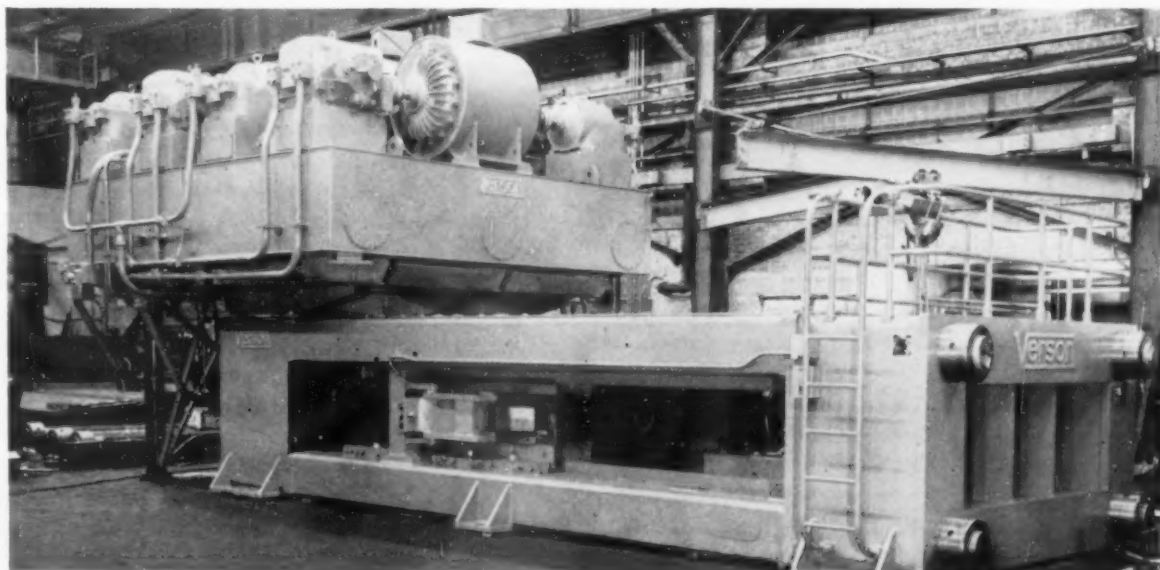
This article covers the following:

1. Production acceleration due to increase in horsepower.
2. Comparison of horsepower and current requirements on mechanical and hydraulic presses on production jobs.

3. Comparison of production on various stroke lengths.
4. Comparison of tonnage requirements on jobs started well above the bottom of the stroke.
5. Production increase by improved handling.
6. Production acceleration resulting from lower maintenance.
7. JIC Standards and production.

The trend in the hydraulic press industry is to power the machine with larger pumps and motors. Fig. 1 shows a 1000-ton horizontal hydraulic press with pumping equipment capable of an output of 864 gallons per minute at 3000 psi. The pumps are driven with four 300-hp, 900 rpm motors. The

Fig. 1. Trends toward increased capacities are apparent in hydraulic press designs. This 1000-ton horizontal press is powered by four 300-horsepower motors.



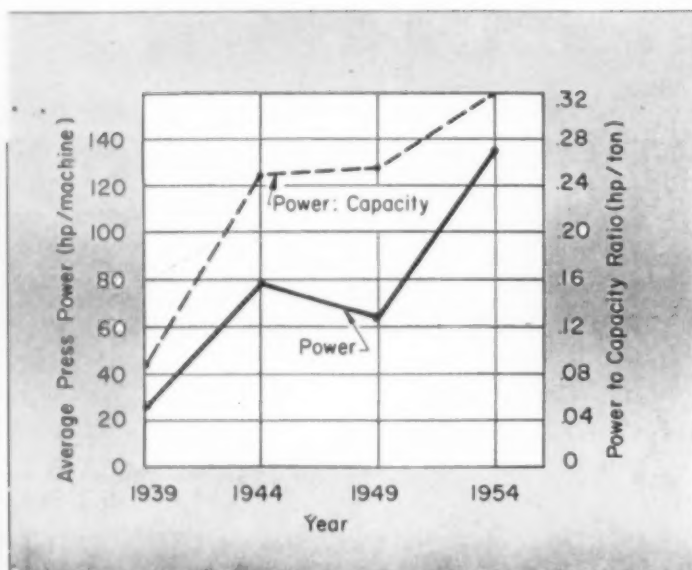


Fig. 2. Chart indicates both increase in power and speed of mechanical presses during the past 15 years.



Fig. 3. Hydraulic straightening press handles plate, weighing 2100 tons, with the aid of motorized handling cars.

pressing speed at full volume of pumping is 250 inches per minute. This is not an uncommon installation.

A representative group of presses for 1954, 1949, 1944 and 1939 is charted in Fig. 2 on the basis of total horsepower and horsepower per ton per press. These charts illustrate graphically the increase in average horsepower which accelerates production in the same ratio, assuming that total stroke and working stroke are average. This can be assumed to be true, as no effort was made to select any particular press for the chart computation.

Hydraulic presses designed by A. B. Farquhar Division of the Oliver Corp., have resulted in a tremendous increase in pressing speeds. In some cases, they are 100 times greater than speeds of ten years

ago. Increased pump capacities have been added which resulted in the design and development of new simple control systems to handle, without shock, the large volume of fluids required to provide press versatility and a variety of pressing actions. While the first cost of present-day presses is higher due to increased pump capacities, this is more than offset by higher production rates, lower labor costs per part, and lower product cost.

Where mechanical and hydraulic presses are compared, it is almost always true that the hydraulic press, to obtain the same production, is provided with a larger motor. This is due to the fact that the electric motor on the hydraulic machine must be sufficiently large to provide sustained power generally without the aid of a flywheel. The mechanical press normally is equipped with a flywheel to store energy during the idle part of the stroke. This energy becomes available during the working portion of the stroke.

At this point, it might be well to clear up some misunderstanding of power requirements. The difference in current consumption between hydraulic and mechanical presses is generally negligible as the true power is basically determined by force multiplied by the distance through which it acts. In other words, a part which requires 300 tons of force acting through 2 inches of distance take 100,000 foot-pounds regardless of the type of machine. A further comparison shows that the mechanical press may be powered with a motor one-half the size of the motor on the hydraulic one. Basically, the double-size motor on the hydraulic press has to be at peak horsepower during the time the press is going through the 2 inches of required distance, delivering 100,000 foot-pounds during that time. The half-size motor has to deliver 50,000 foot-pounds in the same length of time and the remaining 50,000 foot-pounds to do the job is supplied by the flywheel. With respect to capacity of the mechanical press, the half-size motor must return to the flywheel the 50,000 foot-pounds of energy which was used during the work stroke. This means that the half-size motor must work at full horsepower capacity twice as long as the hydraulic motor.

The potential user selecting between the hydraulic and mechanical press for the same production, barring other variables, is faced only with purchasing additional horsepower on the press and not with added current consumption.

To debunk the variation in production figures that plague the hydraulic press industry, comparable quotations have been selected for hydraulic and mechanical presses. A mechanical press, powered by the proper size motor, is geared to obtain 30 strokes per minute. The cycle is 2 seconds and there is no question that the machine can perform according to specifications because the cycle is

determined by nonvariable factors.

The hydraulic press offered for the same job has no fixed ratio which can be computed by an ordinary shopman. To do the 2-second pressing job, operating speeds in inches per minute, are 420 advance, 30 pressing and 420 return. It becomes immediately apparent that the strokes per minute are 10.

This might seem to indicate there is no place for hydraulics in production. The following should prove that hydraulics, if properly applied, have a place, the initial expenditure being much less if a hydraulic press is selected.

As an illustration, a 12-inch draw may be selected which can be made in a single stroke on either a mechanical or a hydraulic press. The piece is a large hood which requires 500 tons in a hydraulic press. The tonnage of the drive required in a mechanical press, however, would be 2000 tons. It may be assumed that 60 feet per minute is the maximum midstroke speed available for a 36-inch stroke press. With maximum midstroke speed of 60 fpm, a mechanical press can be operated at 6 strokes per minute. Due to entering the work close to midstroke, the mechanical press would be equipped with a 2000-ton drive.

The 500-ton hydraulic press for this draw has this rated capacity through the entire length of its stroke. Therefore, no increase in power is required.

For production comparison, the 500-ton hydraulic press is powered with a 250-horsepower motor and the speed of the press in inches per minute will be 1030 fast advance, 124 pressing, and 980 fast return. Calculating the cycle time from these speeds, the 12-inch draw would require ten seconds and the press would also operate at 6 strokes per minute. Production on the hydraulic press equals that of the mechanical press, but only one-fourth of the drive tonnage is required.

A further comparison on a 3-inch draw will show that this 500-ton hydraulic press will out-produce the mechanical press, which must still complete its 36-inch set stroke at 6 strokes per minute. The hydraulic press stroke can be shortened to 10 inches by moving the top limit switch cam. The strokes per minute on the 3-inch draw, operating on a total stroke of 10 inches on the hydraulic press, would be approximately 12.

While the hydraulic industry has been consistently increasing the horsepower on installations, it has not neglected other means of increasing production. This includes improved handling of material to and from the press. This has been particularly true in industries where large-area plates and heavy plates are being use.

A special 5000-ton capacity hydraulic straightening press installed in one of the country's largest steel mills by the Clearing Machine Corp. is illustrated in Fig. 3. This press is furnished with two

motorized cars for moving the steel plate to and from the press. The press is capable of handling plates 200 by 600 x 12 inches thick, the plates weighing approximately 2100 tons. The ram assembly is movable and is power driven from right to left over 160 inches.

In Fig. 4 is illustrated a Verson 1800-ton hydraulic press brake, 44 feet between housings, which is used for automatic production of aircraft skins, leading edges and other aircraft components. The wing skins are fed into the machine by tape-controlled electronic means and are removed from the press brake by adjustable take-away rolls. Fig. 5 shows one of the feed tables, the control tape and the electric-eye mechanism which control the amount of feed of both right and left-hand feed tables. Two outside tables are used for long

Fig. 4. Hydraulic press brake measures 44 feet between housings for automatic production of aircraft skins.

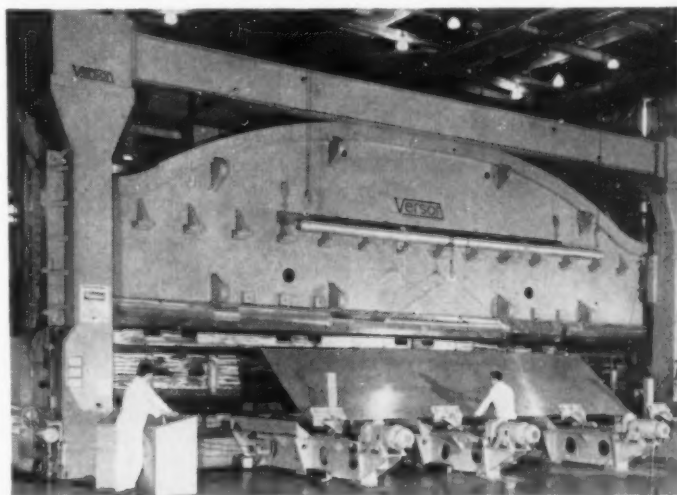
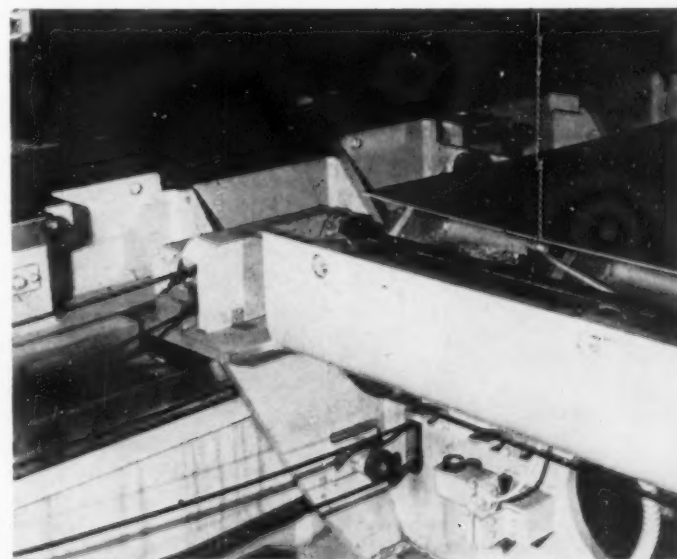


Fig. 5. View of feed table for press in Fig. 4, showing control tape and photoelectric mechanism to control table feed.



MACHINE TOOL PROCESSES

skins; the two center tables are used when the machine is running short parts. The formed wing skin emerges from the machine on adjustable take-away rolls. These rolls and the feed tables are plastic covered to prevent scratching the material. (This interesting press is discussed in *THE TOOL ENGINEER*, April 1955, page 73.)

Automatic feeding tables, expediting loading and unloading of aircraft parts, are shown in *Fig. 6* on a Clearing hydraulic rubber-pad press.

Almost all of the hydraulic manufacturers of rubber-pad presses furnish these presses with dual or quadruple feeding table attachments. The press illustrated has dual type tables. In case quadruple tables are used, traversing mechanisms are furnished operating double tables on small railways.

Many hydraulic press manufacturers have approached the problem of increased production by new designs to eliminate down time due to maintenance. Increased attention is being given to this problem. During the past several years the hydraulic press industry has developed and encouraged the use of subplates and panel-mounted controls as an approach to simplify construction and reduce maintenance. With this same goal in mind, the Elmes Hydraulic Division of the American Steel

Foundries designed, developed and built hydraulic presses, *Fig. 7*, based on the unit-mounted power and control assembly. High-pressure fluid is conducted through short, direct passages drilled in the structural parts. Since the fluid passages are short and direct, heating of the oil due to friction and turbulence is minimized and the press becomes a more efficient unit.

The pumps used in the pipeless circuit are standard 2-way pumps mounted vertically with drive shaft extending upward. They are coupled to standard, vertically mounted motors by means of flexible couplings. The shifting of the pumps is accomplished by specially designed three-position hydraulic cylinders and a directly mounted 4-way solenoid pilot valve. The pump can be removed from the bracket without disturbing the motor.

The surge or prefill valve is mounted on the cylinder and embodies the decompression valve. Subplate type relief valves, to govern the pressing and return pressures, are also mounted on the cylinder. The speed-change valve is flanged to the pull-back side of the cylinder and is controlled by a solenoid pilot valve mounted on the valve body.

Because of the directly connected units, reversal of the press is shockless and response to the electrical control is prompt and precise. The unit mounted controls reduce assembly and maintenance time to a minimum. The only pipes or tubes used are the pilot suction and discharge, drain, cooler

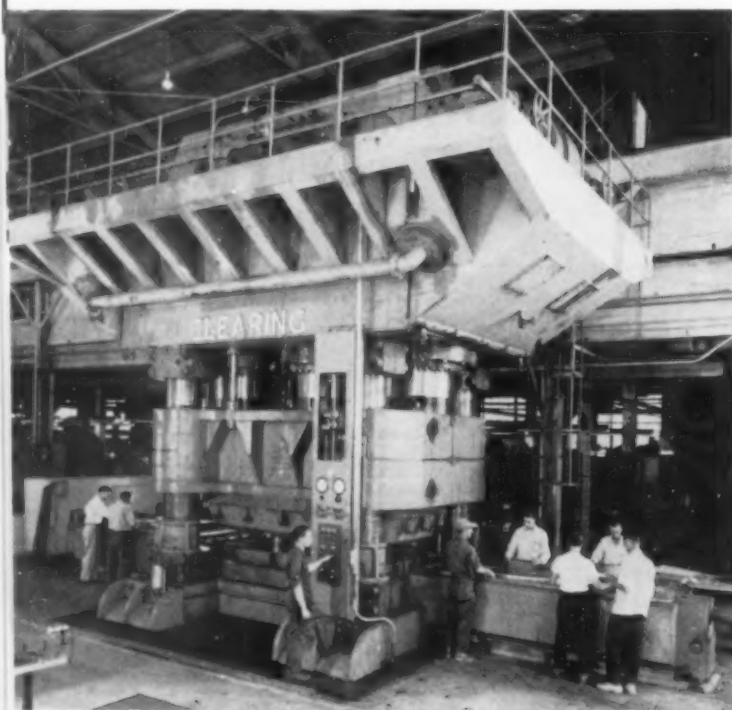


Fig. 6. Automatic feeding tables facilitate operation of rubber-pad press.

Fig. 7. (right) Pipeless-circuit press design improves press operation and reduces maintenance. Use of subplates and panel mounting simplifies construction.

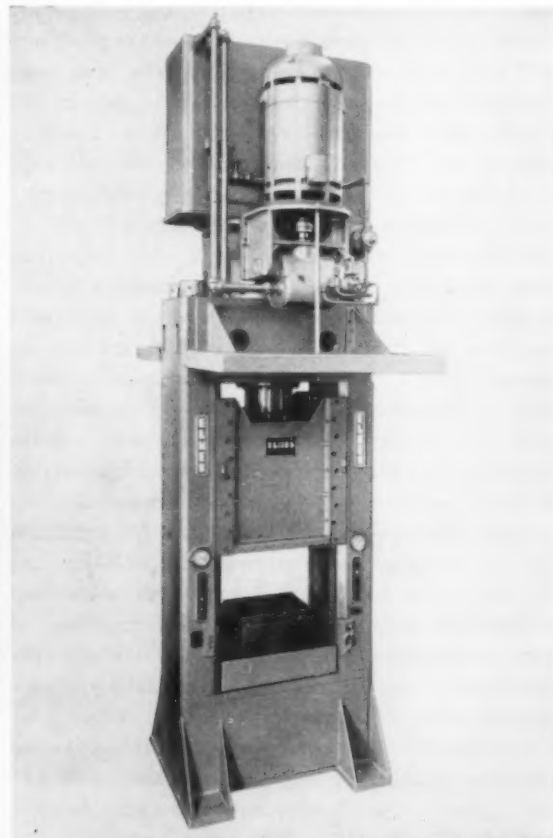
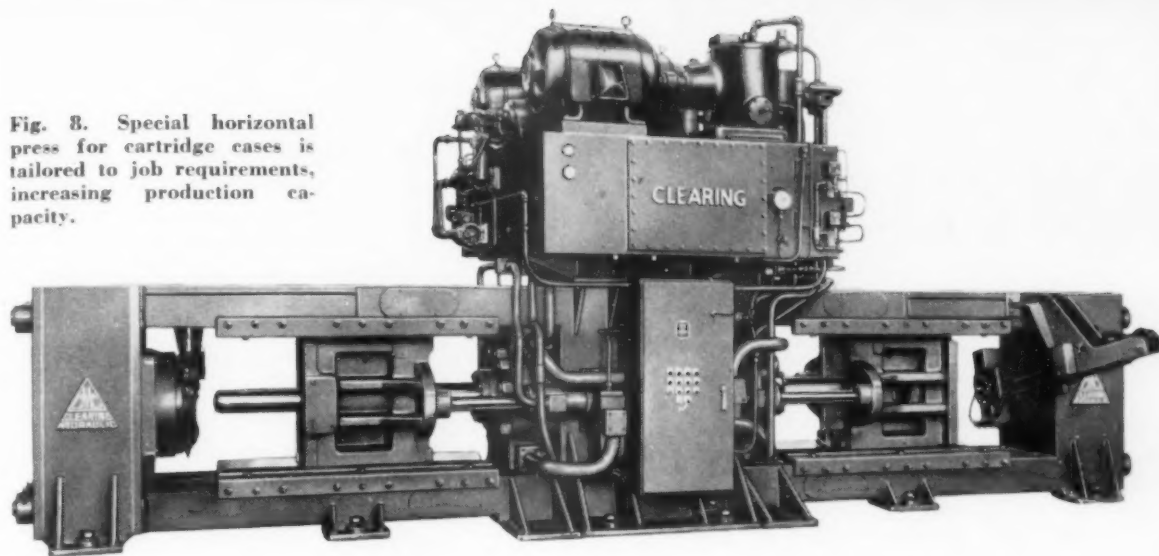


Fig. 8. Special horizontal press for cartridge cases is tailored to job requirements, increasing production capacity.



and filter lines.

Subplate and panel mounting and simplification of oil circuits and piping is given consideration in every new design, and is contributing to a greater number of productive hours per year.

Hydraulic Press Mfg. Co. states that their "Control Operator" is one of the most significant developments in their hydraulic press design. This Control Operator is an adaptation of the hydraulically actuated linkage which gives extensive control of the ram travel speed, both forward and reverse. Maintenance costs are reduced 40 to 50 percent. Various operating sequences can be obtained; e.g., rapid advance, automatic momentary slowdown, full pressure advance, automatic ram reversal and rapid ram return to the initial starting position. Important developments, classified by Lake Erie Engineering Corp., fall into three groups: (1) increased strength and rigidity of press to withstand higher pressures and more concentrated loads, heavier and more accurate guiding as well as heavier platens and tension members; (2) larger high-pressure pumping units for greater speeds and increase in the use of semiaccumulator booster system; (3) development of controls for more flexible as well as more complicated sequential operations and cycles. These developments have resulted in lower costs per piece produced, not only because of increased speeds, but because of increased reliability, reduced down time and maintenance costs.

Single, double and triple-action hydraulic presses, also rubber pad setup for deep draws, have been developed by E. W. Bliss Co. A hydro-dynamic circuit has been incorporated in different types of presses for quick advance and return of ram with slow pressing movement. For cold extrusion presses, quick advance and return may be at 600 inches per minute. These presses have square gibbing for holding slide and tools in accurate alignment in accordance with the requirements of cold extrusion where rigidity, high speed and large ton-

nages are essential.

The information from A. B. Farquhar Division of the Oliver Corp., Hydraulic Press Mfg. Co., Lake Erie Engineering Corp. and E. W. Bliss Co. is from Pressed Metal Institute's *Technical Topics*.

Hydraulic press manufacturers in general are tailoring their design, feeding and unloading equipment to suit the industry that is being served. A photograph, Fig. 8, illustrates this point, showing Clearing Machine Corp.'s approach to the manufacture of cartridge cases. The features of this special press include less working space, lower original equipment cost, less installation cost, shorter operating time, less power and lower productive labor and maintenance costs.

One other means by which the hydraulic industry is cooperating in the effort for increased production is in the establishment of *Hydraulic Press Engineering Standards*, these standards being patterned on essential items in the *Mechanical Press Engineering Standards*. The particular aim of the hydraulic standards is to provide interchangeability of dies in all hydraulic and mechanical presses. The particular items which affect this interchangeability are the bolster, slide and bed opening.

The present standards as set up provide 100 percent interchangeability of dies from press to press which would assist in increased production for the user. The Glossary of Terms has been completed by the engineering section of the hydraulic group and has been approved by the executive group. The proposed standards have been completed by the engineering group of National Machine Tool Builders' Association and are now awaiting approval of the executive group.

This article has been confined to production hydraulic presses. This discussion indicates that the hydraulic press industry is alerted to the fact that this is an age of production and that every effort is being made to design presses in a manner compatible with the requirements of the user.

Repair Plug for Die

Sometimes where a patch or "dutchman" must be placed in the face of a die, it is impossible to use screws or pins to secure it permanently in place. In one such instance the job was accomplished by milling out a cavity to fit snugly on the prepared slug which was to be fitted. Two ends of the rectangular cavity were then milled on their lower edges with a shank type of dovetail cutter. The lower side of the patch was next shaped to leave angular protrusions on the bottom along each of these two ends. A notch was

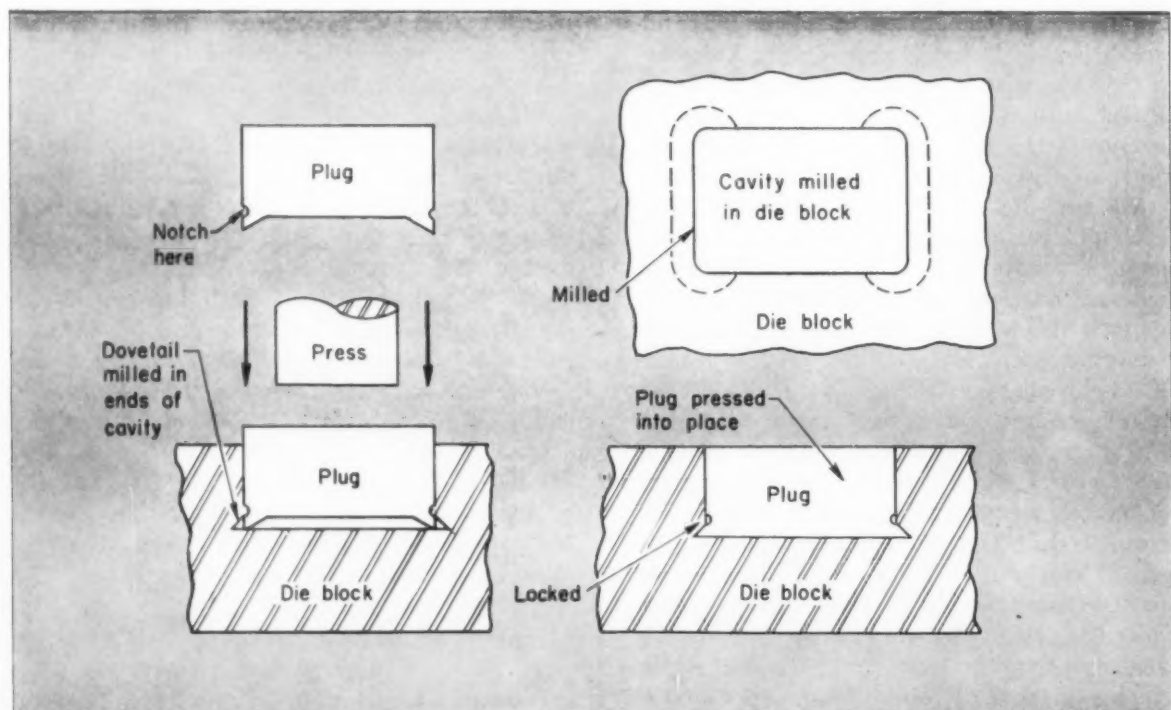
milled along the ends above these angular keys.

The block was fitted into place and the whole assembly placed on a hydraulic press to force the patch tight against the bottom of the cavity. The angular keys bent over into the dovetailed cuts, permanently locking the patch in position.

The sharp bottom on these keys was filed at a slight angle away from the outside edge to help direct the bending of the keys into the dovetail.

H. J. Gerber

*Member-at-Large
Stillwater, Okla.*



If you know of a short cut, unusual machine setup or tool or die design that would help other tool engineers, submit information to the Gadgets department. You will be advancing the tool engineering profession and will receive an honorarium for your idea upon publication.

Safety Riveting Die

To assemble a driving arm for a small machine with two bearing studs an economical production method of riveting the studs had to be designed. The desired result is secured with a press setup employing a movable die which is pulled out from beneath the ram for loading and unloading. As a further safety feature, a precision switch is incorporated in the press circuit so that the press

cannot be operated except when the die is located in proper position.

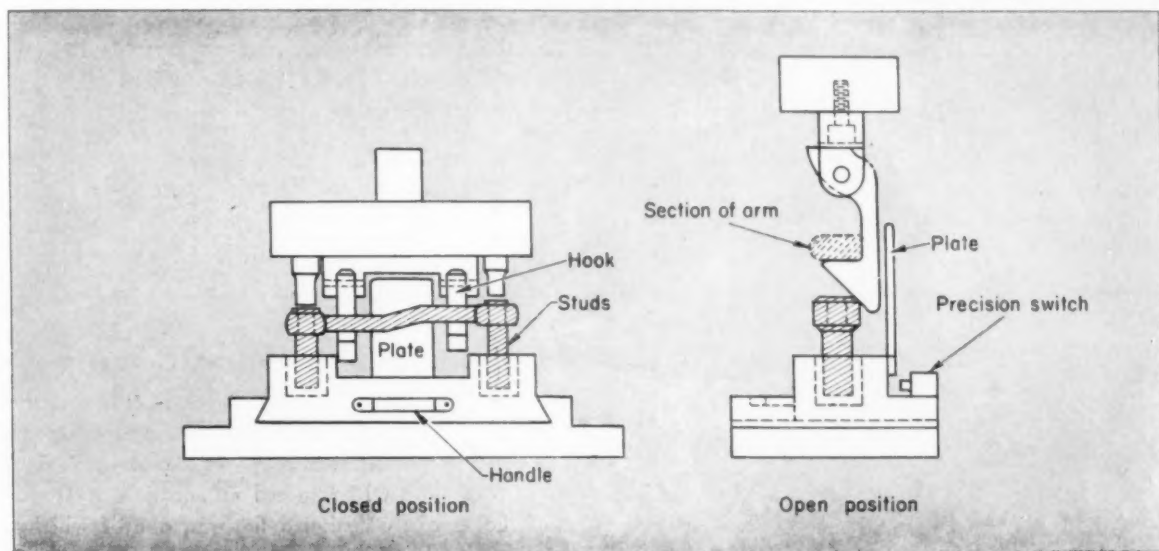
As shown in the accompanying views, the bearing studs are held in a pair of cups which have been hardened. To align the bearing surfaces squarely, close fitting locating sleeves are used. In loading, the driving arm is merely slipped over the two studs. With the work in place the die is slid into position to contact the precision switch.

Free swinging hooks attached to the upper die are used for the part ejector. They are located to pick up both ends of the work simultaneously. When the ram comes down, sloping surfaces on

the hooks act as cams to swing them back out of the way. At the bottom of the stroke as they clear the work, they swing forward underneath the work. When the ram ascends, they pick up the work, pulling it free of the lower die. Lugs on the upper end of the hooks prevent them from swinging forward. When the lower die is pulled out a plate fastened to the back of the die pushes the work forward off the hooks. It drops on the press table where it can be removed by the operator without reaching into the die.

Charles Spicer

Grand River (Ontario) Chapter

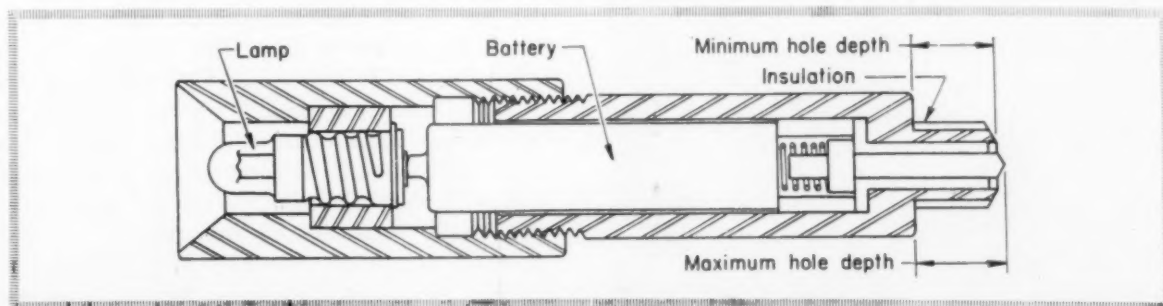


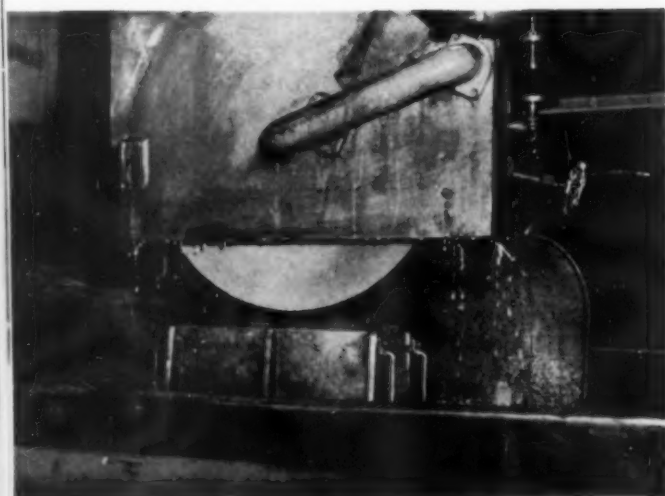
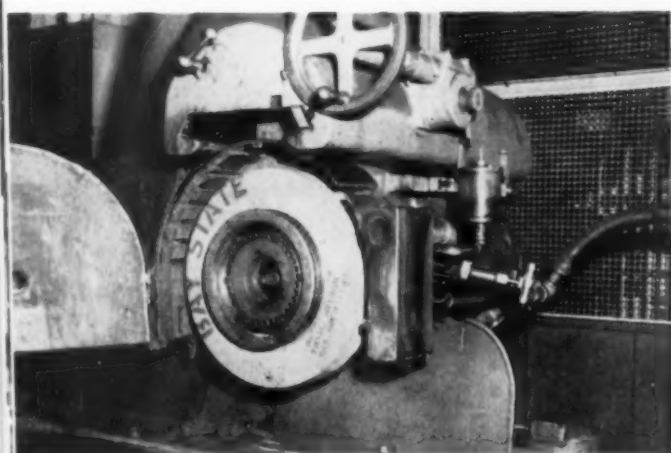
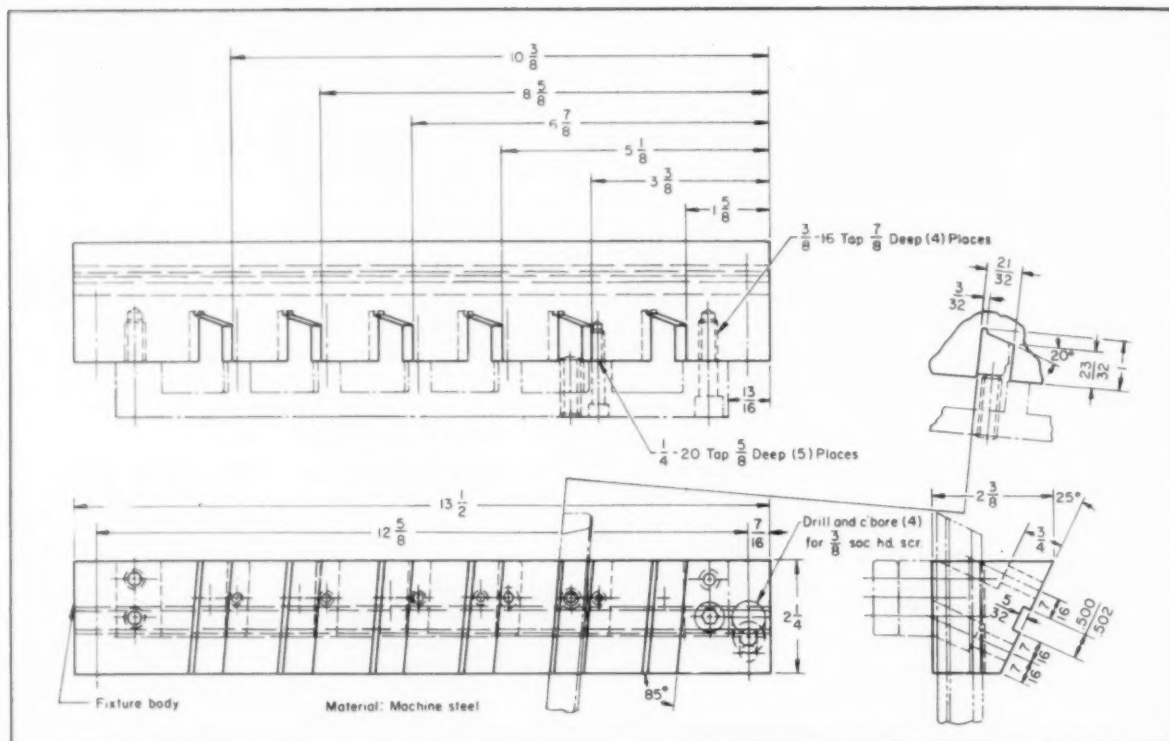
Hole Depth Gage

To facilitate checking the depth of holes in a minimum length of time, the depth gage illustrated was developed. The holes have flat bottoms. When the holes are within the acceptable range, the signal lamp lights in the electric depth gage, powered by a pen light dry cell. If the hole is too deep, the center pin does not contact the bottom and the circuit is open. If the hole is too shallow, the gage

shell bottoms in the hole and the shoulder does not contact the face, also leaving the circuit open. The center pin and the case are case-hardened steel to resist wear. The two sleeves, which surround the pin and the nose section, are laminated fiber to insulate these points. The bulb mounting is a commercial miniature socket soldered into a brass sleeve. This device proved to be a great time saver and permitted large lots to be inspected in a short time by an unskilled operator.

*Henry George
Bronx, N. Y.*





Multiple Tool Grinding Setup

To speed up grinding of large numbers of single-point tools, the multiple setup shown in the accompanying illustrations was devised. From 8 to 16 tools can be handled at one time by means of the specially designed fixtures, one of which is shown in the sketch.

With these fixtures the grinding angle of the tool is preset, as it is built into the fixture body. This eliminates considerable checking and setup time. Visual inspection of stock removal is the only type of inspection necessary. Material is fed into the machine at a rate of 0.002 inch per pass. However, the hydraulic surface grinder used is capable of removing as much as 0.010 inch at a pass. The present rate for the operation is from 200 to 230 tools sharpened during an 8 hour day.

Another unusual feature of this setup is the method of feeding the coolant. As is seen in the close-up of the grinding wheel with the cover opened, coolant passes through the spindle. Centrifugal force drives the coolant to the outside diameter of the wheel at the point where the highest degree of heat is most likely to occur. With this system the coolant is passed through two filters before entering the spindle. Amount of flow is regulated by a control valve. This arrangement has been found to be an efficient method of providing coolant for this grinding setup and contributes considerably to trouble-free operation.

*T. J. Carson
Detroit, Michigan*

Back rail first-operation draw die with the plastic punch, left, surrounded by the steel pressure pad. The right-hand section contains the mating female plastic insert.



beating production deadlines *with plastic draw dies*

By George H. Rigeman*
Chief Tool Engineer
Appliance and Ordnance Div.
Geo. D. Roper Corp.
Rockford, Ill.

PLASTIC TOOLING MATERIALS considerably reduce the spread between product design and production of the product. They permit fast, inexpensive and convenient building of dies for manufacturing simple or intricate formed sheet metal parts. They offer an ideal solution to the problem of producing parts in limited quantities that cannot be economically produced by hand forming yet do not justify the use of steel draw dies. In emergencies, plastics can permit meeting production starting schedules that would otherwise be impossible.

Recently, design changes to a line of gas ranges necessitated the procurement of new tooling for blanking, piercing, drawing, notching and flanging operations. These tools had to be obtained in less than normal time to meet the desired production

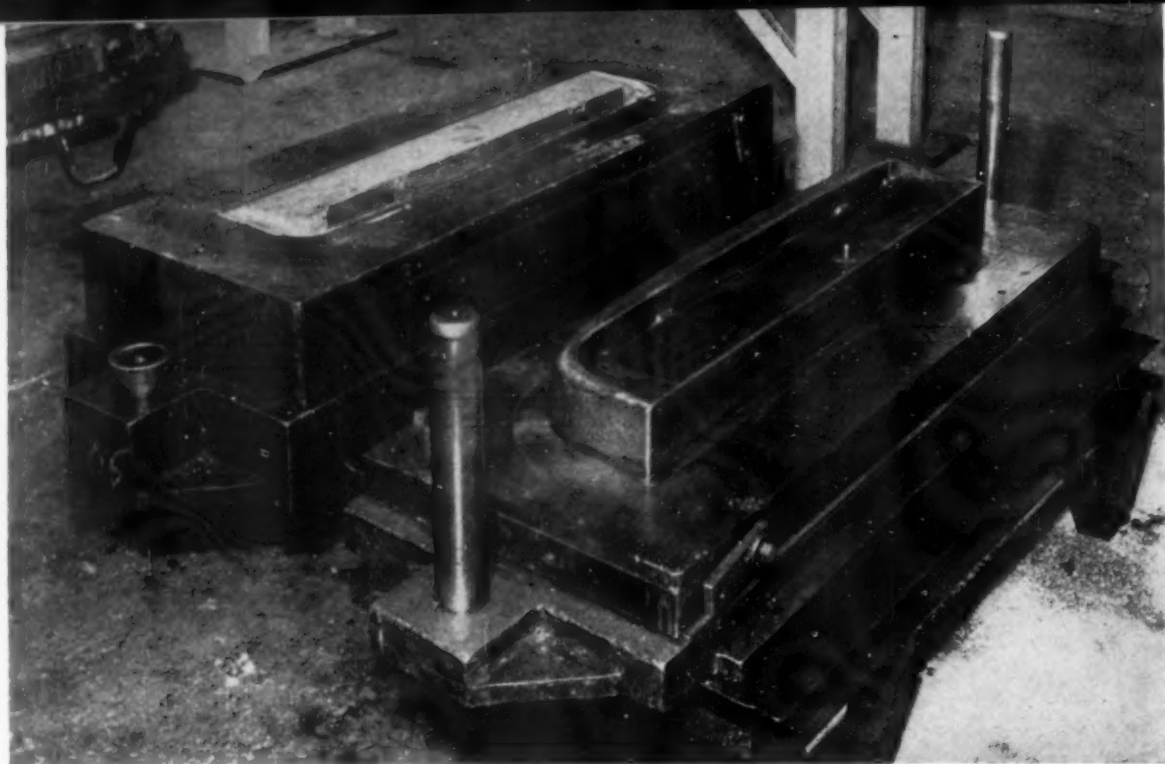
* Senior member ASTE Rockford chapter.

target date. All the tooling could be obtained before this date with the exception of draw dies for the back rail.

The back rail, or splasher, mounts on top and at the back of the range. It contains the cooking light, timer, clock and controls for regulating some of the cooking operations. Because intricate compound curves and radii must be blended in this part, steel draw dies usually require from four to five months to build. Since the required interval was not available, an alternate method had to be found for production of the dies.

A quick appraisal of other methods indicated that plastic form dies could be fabricated in about one-third the length of time and at one-third the cost of conventional steel dies. Two sets of dies were required because the draw had to be made in two steps. Plastic dies were made, tested and in production in about two months.

Punches for both sets of dies are made entirely of plastic and mating female inserts are also plastic. Metal wearplates are mounted on punches to resist scuffing by steel pressure pads that encircle each



(top) Final draw die is similar to first but has more complicated compound curves and radii. Plastic sections were cast to rough contour and hand finished for proper shape.

(center) First and final draw punches removed from steel section to show wearplates and contours.

(bottom) Back rail after first draw, right, and final draw. Each die produced over 20,000 pieces before major die rework was necessary.

punch. Steel inserts are mounted in the plastic and attached by conventional methods to prevent abnormal draw pressure wear at critical points.

Plastics are hard enough to resist normal drawing pressures and wear yet are soft enough to be easily hand filed or machined with a burr. Plastics have especially good properties when repairs are necessary. For example, one of the corners of the second-operation draw die chipped after producing 5000 back rails. The die was taken to the tool-room and the punch was set up for repair. After the chipped section was cleaned, a retaining wall of molding clay was placed around the damaged area. Temperatures of this area was raised by a small heat lamp. Plastic, which was mixed with catalyst while the damaged area was being heated, was poured into the hole and roughly shaped. Hardening took about an hour, after which the original corner contour was restored with hand tools.

Although they were successful, the plastic punches were later replaced by steel punches because production was substantially increased. However, the original punches have been maintained in good condition as stand-bys.

FORCES AND POWER

in metal cutting

By P. A. Smith*, M. C. Shaw and N. H. Cook

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Cambridge, Mass.

KKNOWN CUTTING FORCES are not only of value in research, where they frequently shed important light on what is taking place during chip formation, but they also provide information of value to the tool engineer engaged on production problems. Ways in which cutting forces may be used by the tool engineer or machine tool designer include:

1. Selecting a machine tool of proper power to take a cut of a given size and at a given speed
2. Designing tools, toolholders, fixtures and feed mechanisms of sufficient strength.

In addition to these direct applications of cutting force measurements, a dynamometer is frequently of value as an adjunct in studies of tool wear or surface finish. Just before a tool fails, one of the force components usually rises abruptly. This rise may be used to anticipate tool failure and allow the tool to be removed from service before complete breakdown. Similarly, when different cutting fluids are investigated in the region where a large built-up edge gives poor finish, the cutting force is frequently found to reflect the fluid performance. In the two latter applications, the cutting force is not the only item of interest and this must be kept in mind. While a dynamometer may prove of value in monitoring tests of tool life and finish, to assume that it does away with the need for direct tests of tool wear and surface roughness would be foolish.

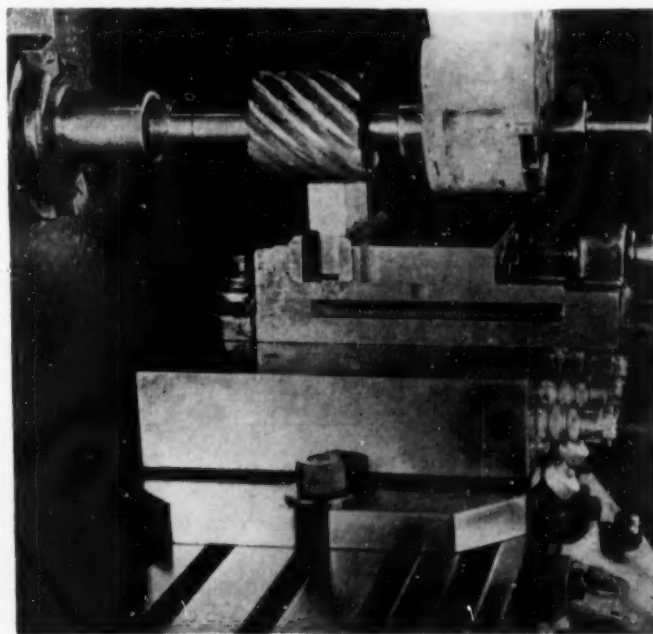
In this article, methods that are used to measure cutting forces will be considered briefly, and the

manner in which the results of such measurements may be conveniently catalogued for use by the tool engineer will be described.

Cutting Force Measurement

In order to measure the forces acting on a cutting tool, a dynamometer or special spring scale is inserted between the tool and the machine or the machine and the workpiece. The special spring scale that is used must be stiff; otherwise difficulty due to vibrations would be encountered in cutting.

Fig. 1. Three-component milling dynamometer.



*Senior member ASTE Boston chapter.

Based on a discussion given at the 1955 ASTE Regional Conference, Massachusetts Institute of Technology.

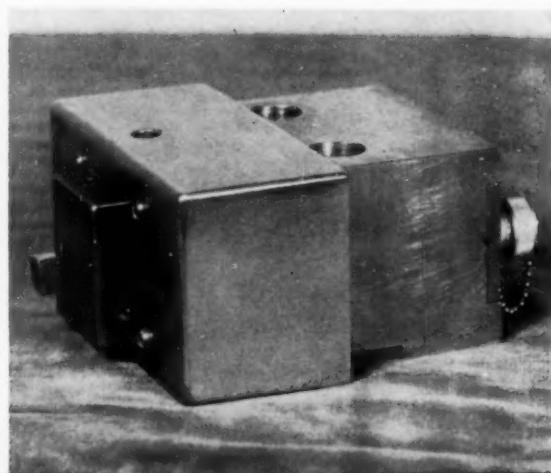
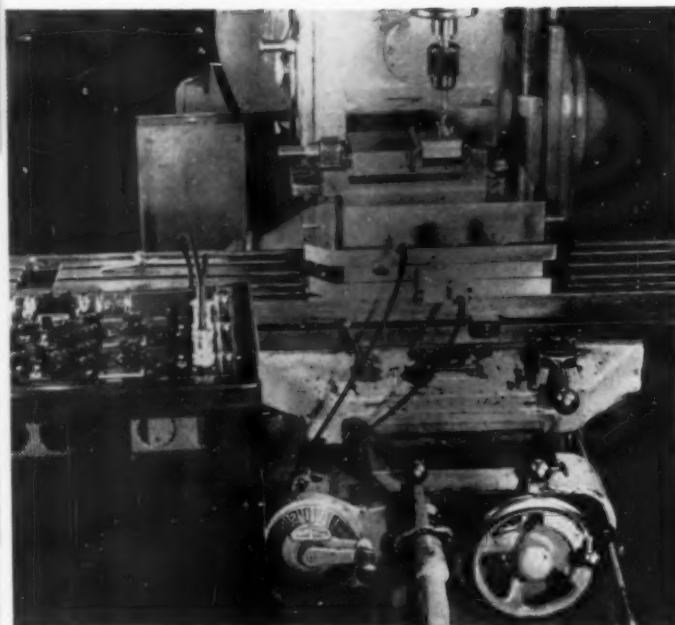


Fig. 2. (left) Torque measuring dynamometer.

Fig. 3. (above) Three-component lathe tool dynamometer.

It is also convenient to measure components of the resultant force on a tool rather than the resultant force itself. Measurements of such force components should be independent of each other. Wire resistance strain gages are convenient for use in constructing metal-cutting dynamometers, and the use of these gages in such applications is well established.

The dynamometer setup shown in Fig. 1 measures three force components in milling operation. Another arrangement for measuring cutting forces is shown in Fig. 2. This is a torque measuring unit for use in drilling or tapping studies. A three component lathe dynamometer, Fig. 3, is used to measure forces in a turning operation. Components measured are the tangential or power force, F_p ; the feed or axial force, F_q ; and the radial component of force, F_R .

All of these devices are used in conjunction with recording equipment that provides a continuous record of the pertinent forces as metal is cut.

The power, P_t , consumed at the point of a cutting tool, in units of horsepower, is simply expressed as:

$$P_t = \frac{F_p V}{33,000}$$

where

F_p = power component of force, lb

V = cutting speed, fpm

Motor power required, P_m , equals this power plus the losses in transmission. Power available at the tool is frequently expressed as the power of the motor times the efficiency, e , of the transmission. Values of e are different for each machine but 0.75 can be considered as an average efficiency.

Cutting Force Calculations

The energy, u , required to remove a unit volume of chips is a measure of the ease with which a metal is cut. In many ways, energy per unit volume of chips removed is similar to the Brinell hardness number of a metal. Both quantities have the same dimensions—force per unit area or, more properly, work per unit volume. Brinell hardness is expressed as kilograms per square millimeter and u is expressed in equivalent English units as pounds per square inch or inch-pounds per cubic inch. Just as indentation depends on the shape and size of the indenter, u depends on tool rake angle (shape) and feed rate (size). In short, u can be thought of as a cutting hardness value.

The value of u is not difficult to determine. Since the energy required to remove chips is the ratio of the cutting work to the volume removed, and this ratio is equal to the ratio of cutting power to volume removed in a unit time,

$$u = \frac{F_p V}{V b t} = \frac{F_p}{b t}$$

where

b = depth of cut, inch

t = feed, ipr

The cutting force and horsepower available at the tool, P_t , can then be expressed by:

$$F_p = u b t$$

$$P_t = \frac{u b t V}{33,000}$$

These two equations give the cutting force and the

power acting on the cutting tool provided u is known or can be estimated.

Energy per unit volume of chips removed varies with the following factors:

1. work material
2. feed rate
3. effective rake angle
4. chip-tool friction
5. tool sharpness

Energy per unit volume is independent of the depth of cut, cutting speed and clearance angle.

The manner in which u varies with work material is shown in the table, where H_B is the Brinell hardness number.

The energy per unit volume of chips removed is found to increase with decrease in feed rate as shown in Fig. 4. This change of u with feed is referred to as the size effect in cutting and occurs for the same reason that a small wire will break at a larger stress than will a larger wire of the same material.

An increase in effective rake angle is found to cause a decrease in u at the rate of about 2 percent per degree change. Thus, if the rake angle is varied from 15 to 30 deg, the value of u should be expected to decrease by about 30 percent. The effective rake angle is neither the back nor side rake

Energy Requirements for Unit Volumes of Metal Removed

Workpiece Material	Energy per Unit Volume* u (in.-lb/cu in $\times 10^6$)
Magnesium alloys	0.04 to 0.06
Aluminum alloys	0.05 to 0.09
Leaded brass	0.07 to 0.12
Unleaded brass	0.22
Copper	0.35
Cast iron: ($H_B = 125$)	0.12
($H_B = 150$)	0.16
($H_B = 200$)	0.32
($H_B = 250$)	0.40
Steel, free machining:	0.18
($H_B = 150$)	0.26
($H_B = 200$)	0.30
($H_B = 250$)	0.34
($H_B = 300$)	0.36
($H_B = 350$)	0.40
($H_B = 400$)	0.50

*Turning operation. Tool has effective rake angle of 15 deg, feed is 0.01 ipr and depth of cut is 0.1 inch.

in a lathe tool but rather the rake angle measured in the direction of chip flow. Usually, the direction of chip flow can be assumed to be perpendicular to the principal cutting edge of the tool.

In general, the value of u will decrease when the friction between chip and tool is decreased, as when a good cutting fluid is used or when the tool is sharp. However, this is not always the case due to the peculiar properties of the built-up edge.

Suppose it is desired to estimate the cutting force and the motor power required to make a cut on a lathe under the following conditions:

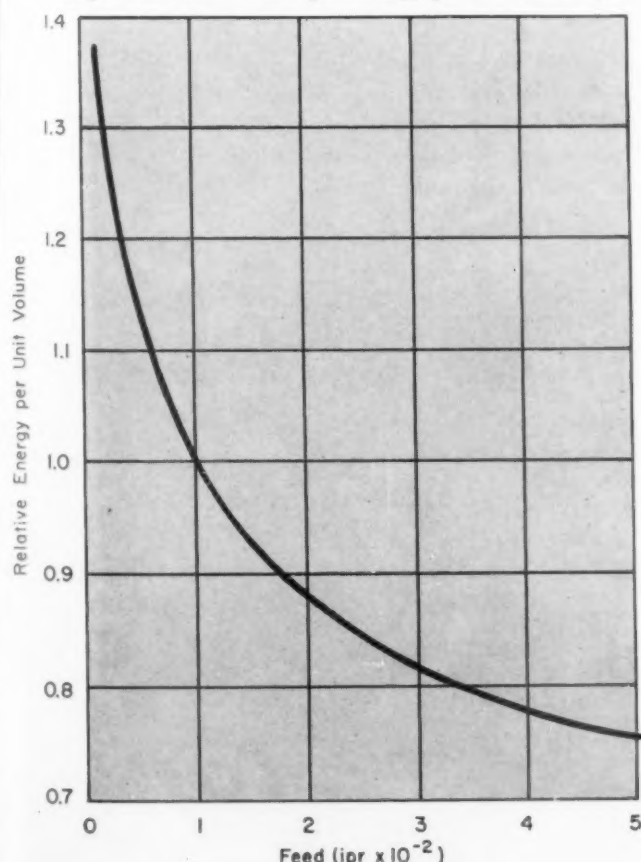
Material: steel of 250 Brinell hardness
Cutting speed (V): 200 fpm
Feed (t): 0.02 ipr
Depth of cut (b): 0.1 inch
Effective rake angle of tool (α_c): 10 deg
Machine efficiency (e): 75 percent

Then:

- (a) From the table, $u = 340,000$ in.-lb/cu in. (for $t = 0.01$; $\alpha_c = 15$ deg)
- (b) From Fig. 5, $u_{0.02}/u_{0.01} = 0.88$ and, after correcting for feed, $u = (340,000) (0.88)$ in.-lb/cu in.
- (c) The value of u for a 10-deg rake angle tool will be 10 percent greater than for the 15-deg tool on which the table is based. Therefore, after correcting for feed and rake angle, $u = (340,000) (0.88) (1.1)$
- (d) $F_p = (340,000) (0.88) (1.1) (0.1) (0.02) = 660$ lb
- (e) $P_t = \frac{(340,000) (0.88) (1.1) (0.1) (0.02) (200)}{33,000} = 4$ hp
- (f) $P_m = \frac{4}{0.75} = 5\frac{1}{3}$ hp

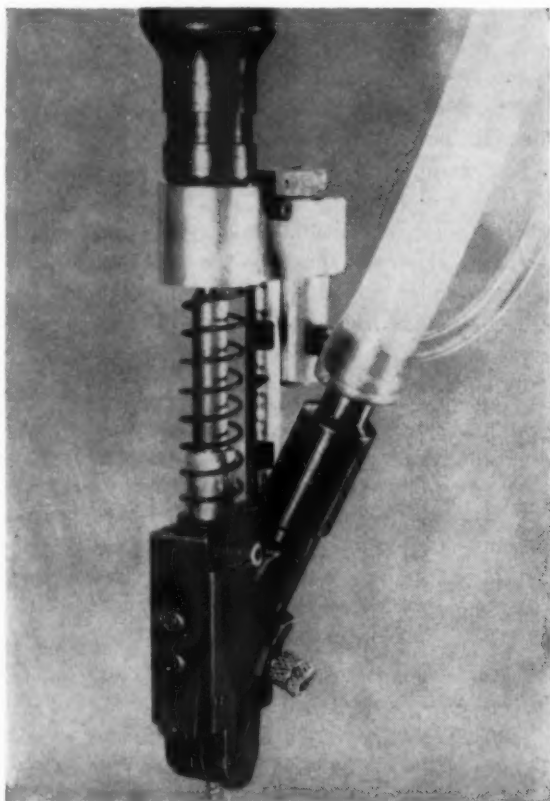
Cutting forces on and power consumed by a wide variety of other cutting tools may be similarly estimated by use of the energy per unit volume of metal removed.

Fig. 4. Effect of feed upon energy per unit volume, u .



designed for **PRODUCTION**

Automatic Screw Feeder Speeds Fastening

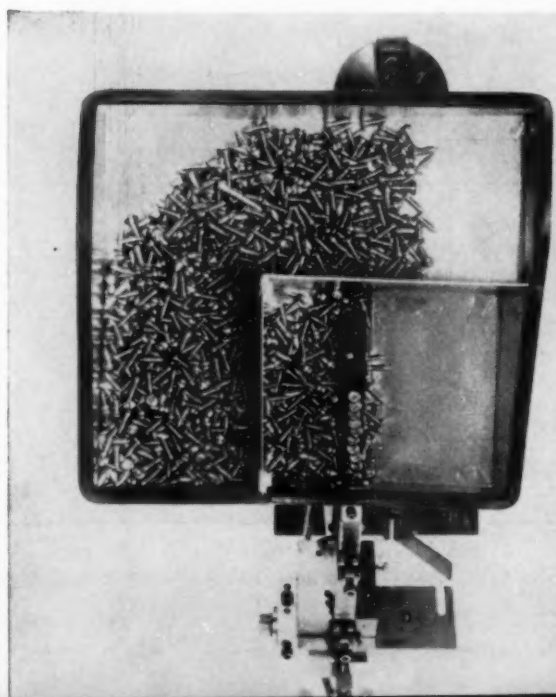


SCREW FEEDING DEVICE bit is retracted so a screw can be pneumatically conveyed through the large plastic feed tube to the collet. Tumbling of screws during conveying is prevented by changing the inside diameter of the feed tube to suit the screw size. When the bit is in driving position, it is ready to be actuated by the power screw driver. After one screw is driven, the next is automatically fed to the bit.

SCREWS for at least four hours work are stored in the reserve hopper, large area. Screws are selected by an elevator at the bottom of the pick-up hopper, smaller area, and are fed to a magazine track that delivers them to the feed tube. The pick-up elevator is designed so the points of the screws must be downward when they are fed into the plastic tube.

FEEDING SCREWS to power screwdrivers has long been a problem that needed solution. During recent years, welding and other techniques have made inroads into areas once exclusively served by screwfasteners. One important reason for this is that, even with power screwdrivers, operators spend no less than 50 percent of their time placing and hand-starting screws. Pneuma-Serve, Inc., Cleveland, Ohio, has developed an automatic feeding device that speeds fastening operations from 50 to 400 percent.

This feeding system includes a hopper, a feeding mechanism and a head that fits almost any standard power screwdriver. The head grips screws in such a way that they may be driven at any angle in any plane. After one screw has been driven, the next is automatically fed and positioned. The driver and head assembly may be as far as 20 feet from the hopper. With such flexibility, the fasteners can be taken to the work instead of vice versa.



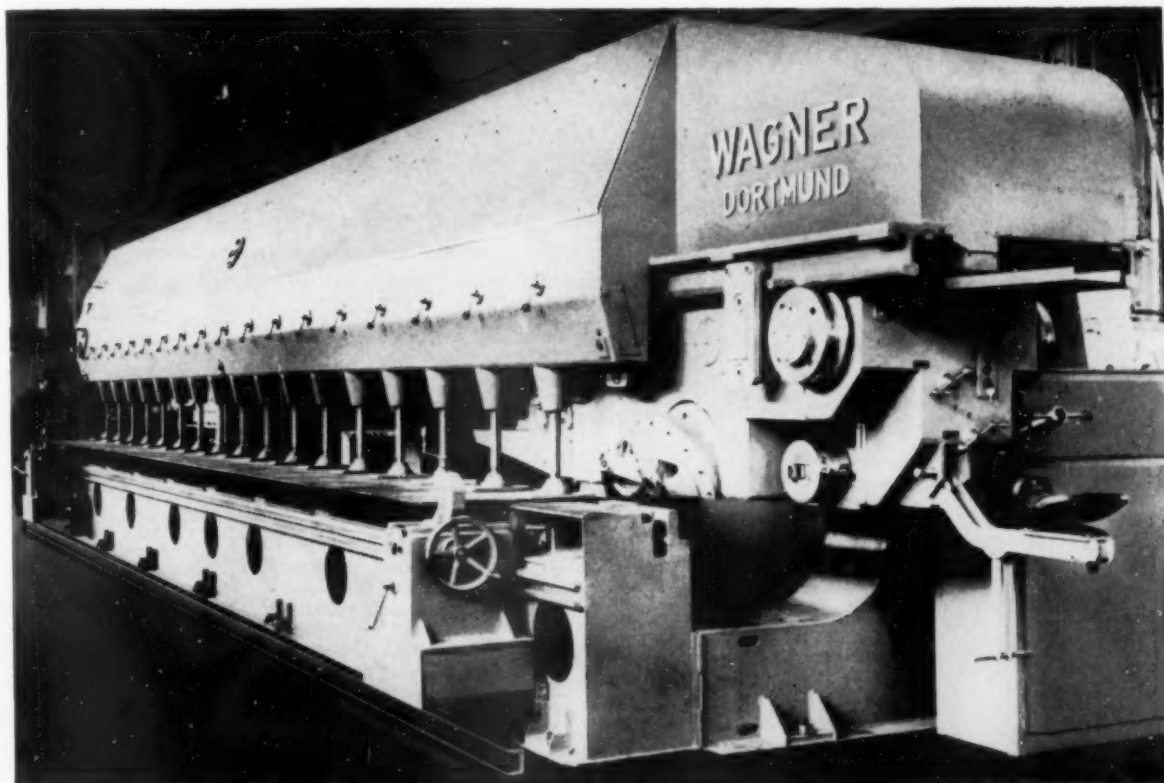
Roller Shear Cuts and Planes Plate for Welding

A ROLLER SHEAR PLATE cutting machine can be used for cutting off, straight cuts and beveled cuts. Through the addition of a planing attachment, edges of the sheared plate can be prepared for any type of welding operation. Available in various sizes, the machine can cut and prepare plate up to 49 feet long and 1 inch thick. The planing attachment can handle a maximum thickness of 2 inches. These machines are manufactured by Wagner & Co., Dortmund, and are handled in the United States by Kurt Orban Co., Inc., Jersey City, N.J.

The suspended knife and planing carriage is directly driven by a rack and gear arrangement. Since the main drive motor and gears are located in the carriage, a minimum of highly stressed

moving parts are needed. Two pinions, with automatic load equalization, engage the rack, which is located on the lower side of the heavy holding beam along with the bus bar. Feed movement is steady and, along with the machine rigidity, leads to high accuracy.

Clamping of the plate is pneumatic. Pushbutton panels at both ends of the holding beam permit selective actuation of the solenoids in such a way that either the first or the last clamping element is actuated first, permitting aligning of the plate without difficulty. Remaining clamping elements can be added continuously in groups so that possible waviness in the plate can be minimized. When short plates are cut, those clamping elements not needed can be by-passed.



UPPER KNIFE CARRIAGE holds two circular knives, adjustable axially and radially. One knife is used for straight cuts, the other for beveled cuts. The bevel-cut knife can be quickly replaced by other knives with different axial radii so plate edges can be prepared for butt welding or for bevel welding. Both knives can cut in both feed directions of the

carriage. The planing attachment also works in both directions. It is held in a swiveling tool head that is adjustable within a wide range, both horizontally and vertically. For added convenience, the operator rides along with the knife carriage on a comfortable seat so he can watch the cutting action easily. Control interlocks insure safety of operation.

Self-Truing Grinding Machine

Compensates for Abrasive Removal

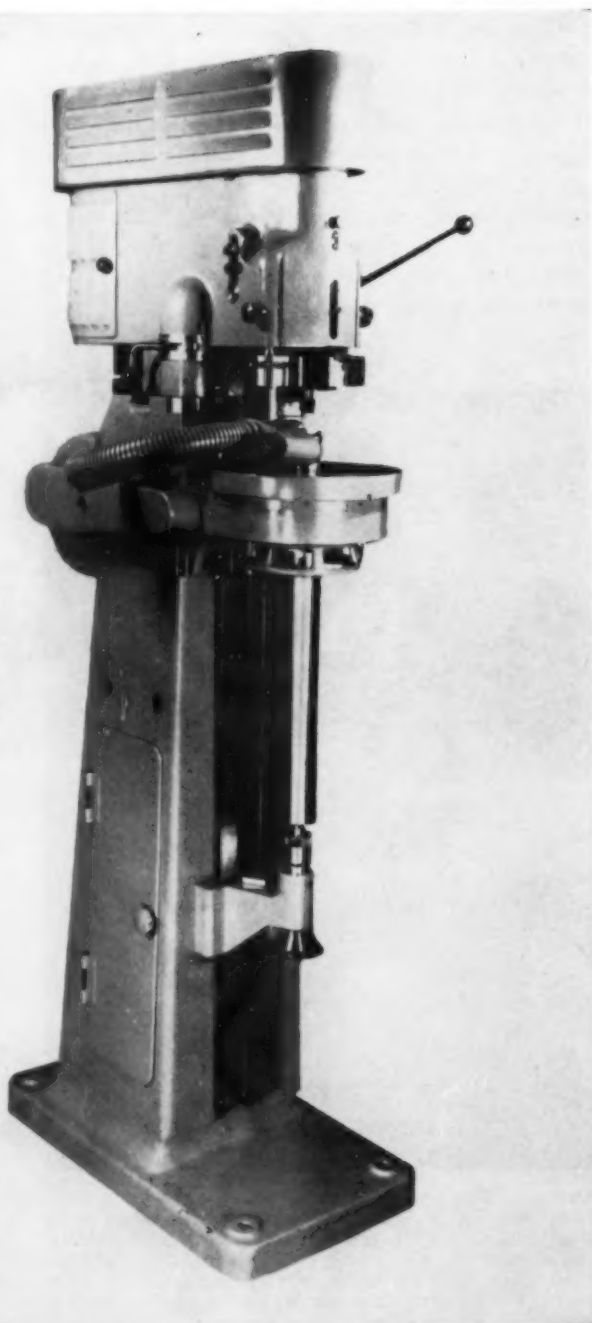
By Paul Grodzinski

London, England

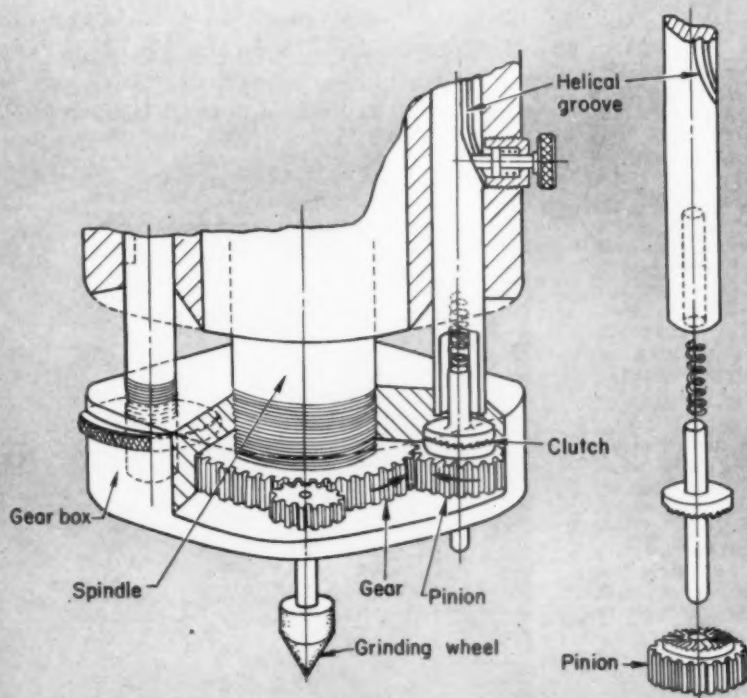
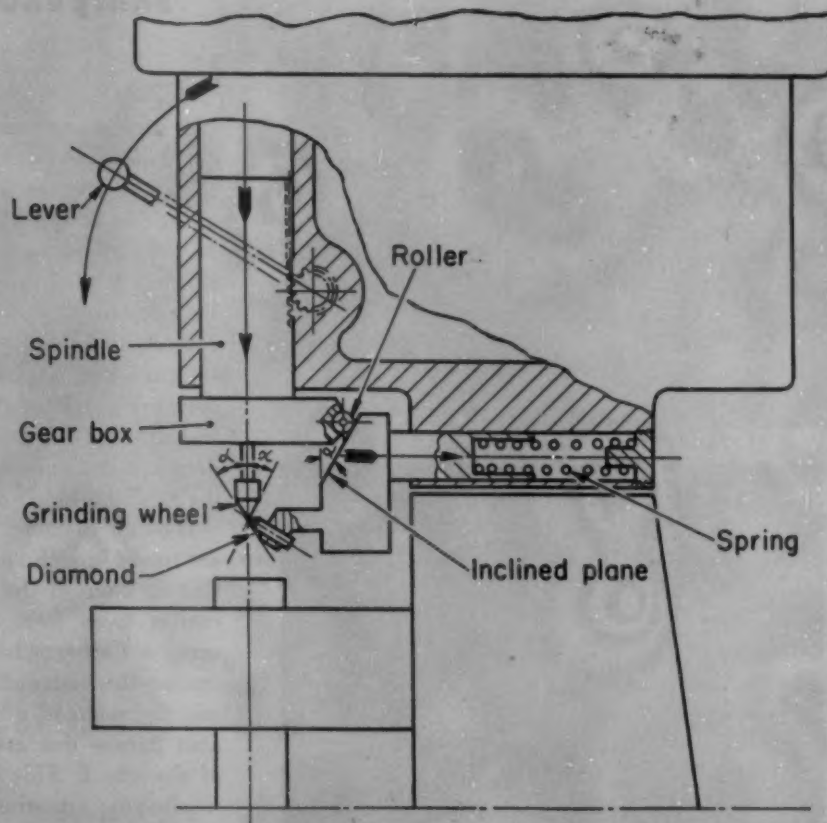
A SPECIAL MACHINE has been developed for grinding the centers of high-powered mandrels in a vertical position. The machine, designed by Station d'Essais de Machine-Outils (SEMO), Issy-les-Moulineaux, France, is equipped with an automatic truing device that operates after each stroke and a gear in the spindle head that advances the wheel by a distance equal to the amount of material that has been removed from the wheel during truing.

An auxiliary pinion, operated manually, adjusts the gearbox for the initial stroke. The ratchet clutch can be disengaged while this adjustment is made.

SPECIAL MACHINE for grinding mandrel centers drives the grinding wheel at 23,500 rpm and rotates the mandrel at 160 rpm. Cutting depth of the truing diamond is usually 0.02 mm and wheel position is automatically adjusted for this change in dimension.

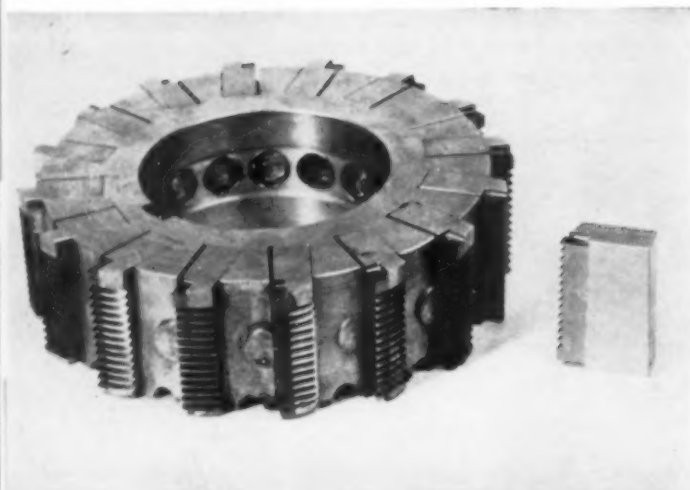


GRINDING SPINDLE is brought to the work-piece by a rack and pinion actuated by the lever. As the wheel descends, it is trued by the diamond. The inclined plane is held against the gearbox roller by spring pressure so that the correct angle is maintained on the grinding wheel. After each downward movement of the wheel, the diamond returns to the truing position.



POSITION OF THE SPINDLE, relative to the gearbox, is determined by the internally threaded gear. When the spindle is raised, an adjustable guide, sliding in a helical groove, causes the pinion to rotate. This rotates the gear and feeds the grinding wheel downward a predetermined distance to compensate for the material removed during truing. When the spindle is lowered, the one-way ratchet clutch slips and the pinion does not rotate.

DESIGNED FOR PRODUCTION

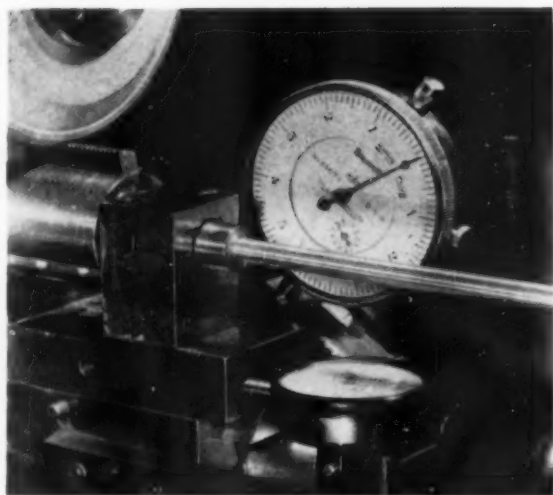


Special Thread Milling Cutter Sharpened for Long Life

A SPECIAL THREAD CUTTER for $1\frac{1}{2}$ -inch pitch pipe threads, having unusual design features combined with cemented carbide, cuts over 1000 linear feet of threads between grinds, or a total of 30,000 feet during the life of the cutter. The cutter, developed by the screw machine unit of General Electric Co., Pittsfield, Mass., represents a good example of special tooling for a specific operation. It is used on a planetary thread miller in which the work is held stationary while the cutter is automatically cycled inside the work. Added tool life is obtained by including an antibacklash feature in the machine which permits climb milling.

H-bomb diamond wheels of 100 and 200 grit are used to rough and finish grind the thread form. Cutting edge of the diamond wheel is dressed to correct tooth form in a small universal grinder using a Carborundum wheel turning at 5000 sfm against the diamond wheel turning at 40 sfm. In use, the diamond wheel is mounted between aluminum flanges that extend close to the cutting edge of the wheel. This provides a rigid construction, eliminating vibration and chatter, to assure accurate, repetitive results.

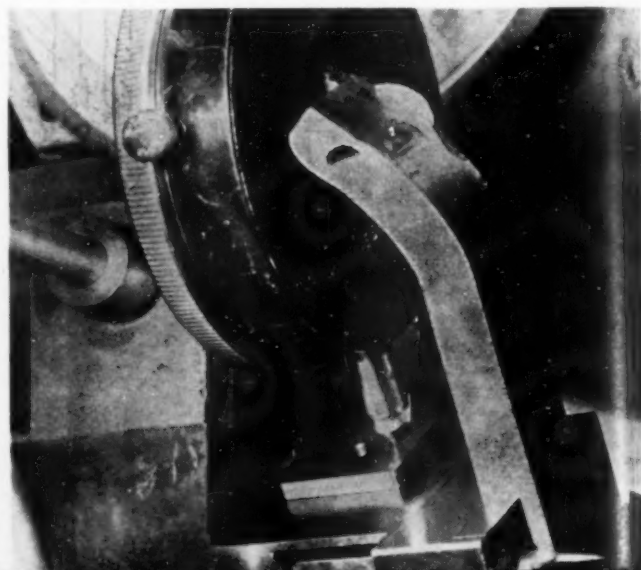
Because of the way wear occurs on the teeth, the sharpening method shown by the illustration removes less material than face or flute grinding. About 30 radial regrinds can be made during the life of the inserts, rather than the eight to ten that would be maximum with face grinding. Cutters are used until wear amounts to 0.0025 inch and then about 0.003 inch of material is removed.



(top) INSERTED TOOTH DESIGNED thread milling cutters are made in several sizes to accommodate the work being processed. The inserts, tipped with Carboloy grade 350 carbide, are fastened into the soft steel body of the cutter by a tapered pin.

(center) INSERTS ARE POSITIONED for grinding the threads by means of a special fixture. A hand-rotated cylindrical insert holder, horizontal dial indicator and sine bar, and vertical dial indicator greatly simplify thread grinding. The slot in the cylindrical insert holder is off-radius by the correct amount to produce the desired end relief on the individual teeth. The horizontal dial indicator is used to position the first tooth to be ground so all inserts in a set exactly duplicate each other.

(bottom) SINE BAR and vertical dial indicator measure the advance of the insert holder needed when changing the grinding position from one tooth to the next. The sine bar angle is such that tooth spacing is indicated by an exact multiple of one revolution of the indicator needle. The dial is calibrated in ten-thousandths and the indicator stem has sufficient range for about $\frac{1}{2}$ the number of teeth in an insert. When the stem reaches its limit, a gage block is inserted, as shown, after which grinding is continued.



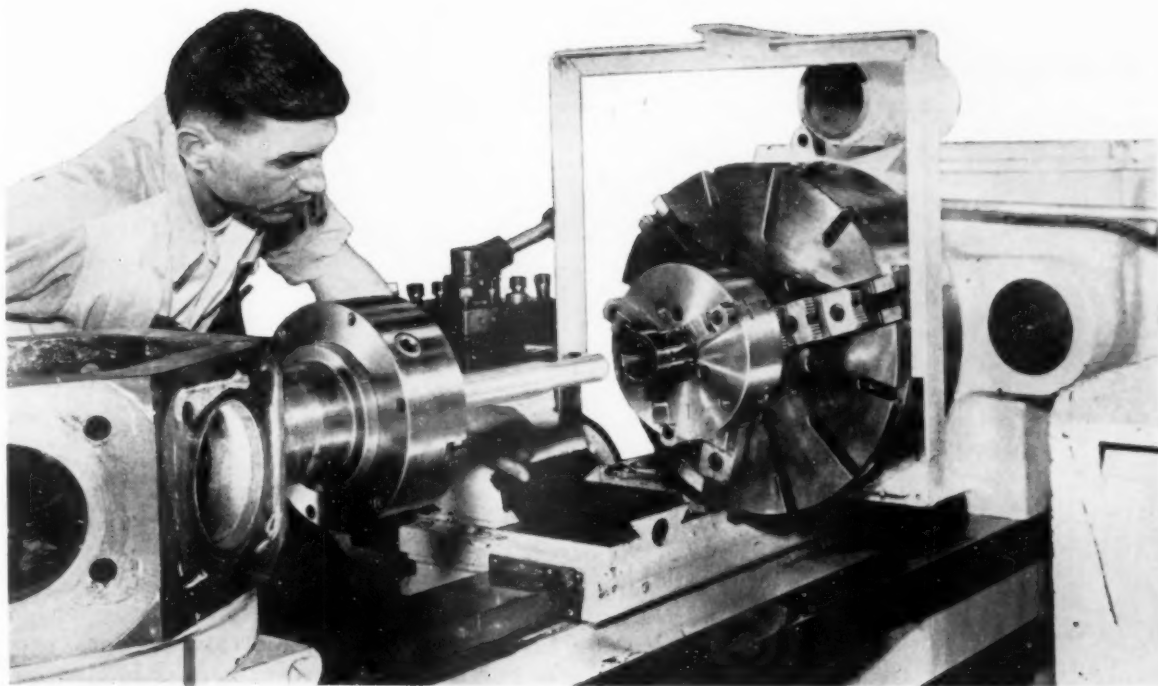


Fig. 1. Latest tube swaging operation employs helically fluted die rotated in chuck of turret lathe as tubular piece-part is advanced by turret.

advancements in tube swaging meet design challenge

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BECAUSE OF THE IMPORTANT role of tubing in airplane manufacture, new swaging methods have had to be developed constantly to meet design and production requirements. For example, one of the latest improvements involves the use of helically fluted dies which are rotated in the headstock of a turret lathe as the tubing is advanced in the turret, Fig. 1. This tooling promises many improvements over previous types for current production requirements.

As applied to metal tubing, swaging consists of forming the tube to a smaller diameter in the de-

sired area, generally an end, by subjecting the tubing to forming forces. The swaged section must remain circular. The need for swaging occurs in joining tubes of different sizes. For fluid connections, one tube is usually swaged and a nut slipped on. The tube is then flared to hold the nut and secure a leak-free seal, Fig. 2.

Tube swaging became necessary to meet the changing requirements in aircraft construction. For instance, the XPW-9 Boeing pursuit ship featured arc-welded steel tubing structure, an innovation in the wood construction era. Use of tubing in airplane design has grown tremendously since then, introducing production problems of tube swaging. Swaging processes have been developed concurrently with changing requirements.

Especially significant from this viewpoint, was the B-17 bomber, both in terms of emphasis on production quantities and the large number of swaged tubes per ship. Many swaged tubes were

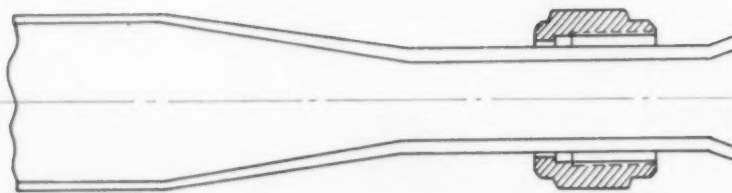


Fig. 2. Typical swaged fluid line for aircraft with flared end and coupling nut.

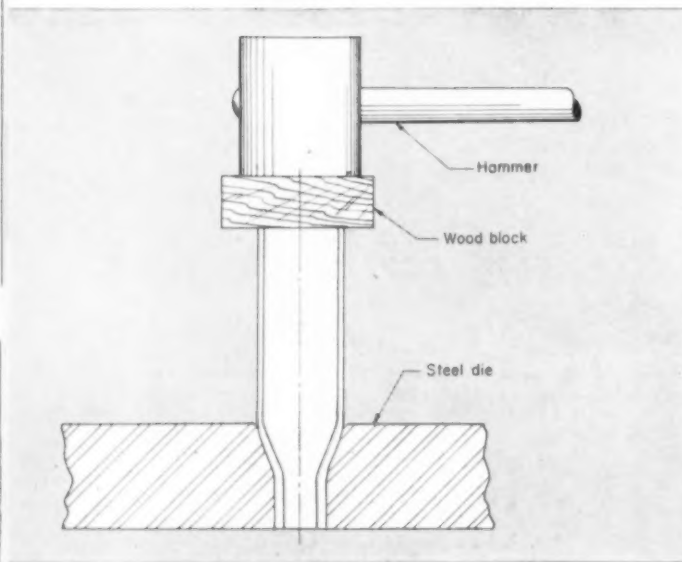


Fig. 3. Early impact swaging method for copper tubing consisted of hammering tube into stationary steel die.

required for de-icing equipment in both the B-17 and B-29 bombers. For instance, more than 1000 swaged tubes were required for fluid lines of the B-17. Since then, designs for de-icing equipment have shifted from fluid to hot-air systems, which, of course, has resulted in different requirements for tubing. In addition, current aircraft designs involve many more swaged tubes for control system applications than previously.

Process Improvements Developed

Practically, the production development of tube swaging methods began with the B-17 model. Swaging appeared to offer the most reliable means of providing tubing connections. Copper was the material involved, since aluminum and stainless steel tubing were not yet an important factor in aircraft design. Production tubes were first swaged by an impact process of pounding the copper tubing into a steel die with a hammer, *Fig. 3*.

This method, however, was far from satisfac-

tory because of the excessive production time involved and a high rejection rate. Attempts were made in the drop hammer shop to form swaged tubes between two hammer dies but this method was abandoned because of severe tube marking at the die parting line.

Then consideration was given to the idea of modifying a spinning lathe so it could be used to swage tubing. By this process some 600 tubes were swaged. The tube was set up to rotate by clamping it in a jaw chuck on the headstock. The lathe was modified at the tailstock to hold the die and allow it to be advanced onto the tube, *Fig. 4*.

Although this method was an improvement over those previously used, the operation was still overly costly. Scrap rate was high with too many tubes twisted, scarred and distorted from being clamped in the three-jaw chuck. However, the process did produce the desired results. Additional problems for tool engineers appeared as airplane design changed to incorporate stainless steel and the aluminum tubing.

A good solution was found when a turret-type lathe was tried out for possible adaptation to the swaging operation. This equipment proved successful when the swaging die was rotated on the

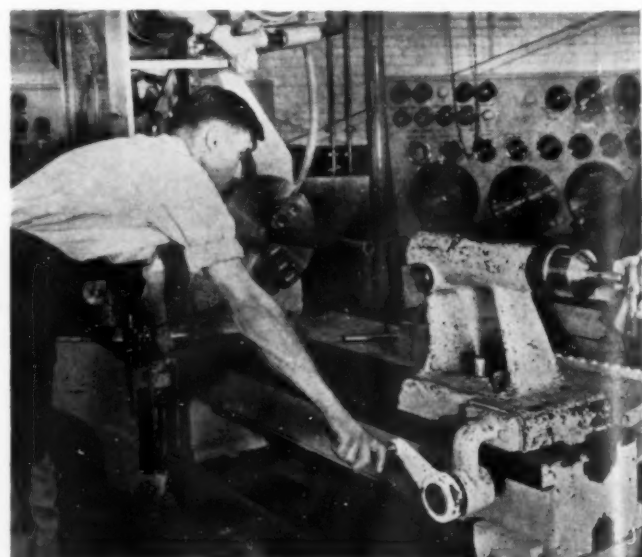


Fig. 4. Swaging operation in spinning lathe featured stationary die and rotating piece-part.

headstock while the tube was held in the turret and advanced into the rotating die by the turret operation mechanism, Fig. 1. Since that time company developments have been concerned primarily with improving the design of swage dies for use in this setup.

A smooth swage die of Micarta was the first successful die to be used in the turret lathe operation for swaging aluminum tubes. The die material was subsequently changed to heat-treated steel. The hardened steel die proved a definite improvement over Micarta because of increased die life and better dissipation of heat generated during the forming operation. A typical smooth swage die is shown in Fig. 5.

Swaging in Turret Lathe

To discover a satisfactory die material for swaging stainless steel presented another problem. Again Micarta dies were used at first but were found to have limited life. Heat-treated steel dies were tried next but were unsatisfactory because of galling and scoring of both die and tube. Several bronzes were tested, but again with these die life was limited to a few parts. Finally $\frac{1}{2}$ -hard navy brass was selected as the best die material for stainless steel, as it produced approximately 500 swaged tubes before requiring replacement.

Smooth swage dies, which were used up to 1942, were limited to 20 percent tube reductions; the friction inherent in the die design prevented aluminum tubing from being swaged to any greater degree than that. For greater reductions both anneals and additional dies were required. To overcome the restrictions of the smooth die, one was designed with flutes in the straight portion of the die, Fig. 6. All combinations of numbers of flutes from two to seven were tried. Three flutes were finally chosen as the optimum. This die appeared to reduce the friction forces and reductions up to 40 percent could be accomplished in one die without resorting to anneals.

With hot-air ducts or electrical equipment replacing fluid lines for de-icing, and with the advent of high-speed aircraft using booster systems and other devices for operating control surfaces subjected to high aero-dynamic loads, a further design evolution involving tube swaging has taken place since the war. The major request lately for swaged tubes has arisen from the necessity of forming actuating rod ends to effect a suitable connection with end fittings. As it now appears, tubes will continue to be swaged for fluid line application, but the concentrated development effort will be directed toward providing the best structurally efficient actuating rod possible.

As with other phases of industry, tool engineers are constantly seeking to improve production tech-

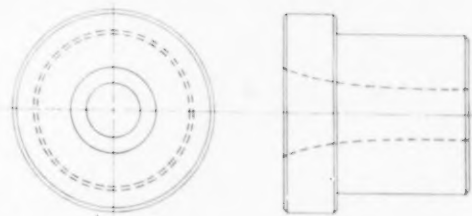


Fig. 5. Smooth-wall swage die of steel was major advance in aircraft tube swaging process.

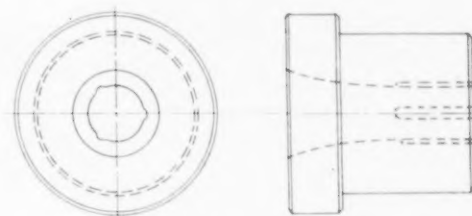


Fig. 6. Short-flute swage die, flutes extend only through straight portion.

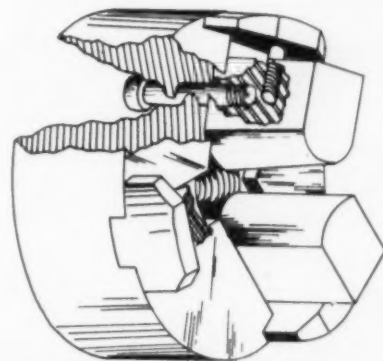


Fig. 7. Adjustable segmented swage die.

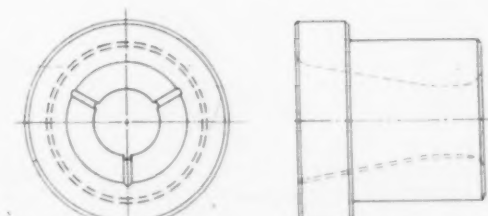


Fig. 8. Straight-flute swage die with flutes extending through die.

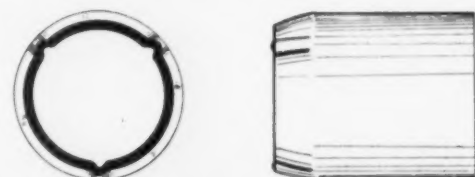


Fig. 9. Graphic illustration of gripping action of fluted swage die.

Fig. 10. Curve of diameter-wall thickness relationships for 24S-0 tubes swaged with fluted die. Diameters tested include 2-inch OD maximum and 1-inch OD minimum.

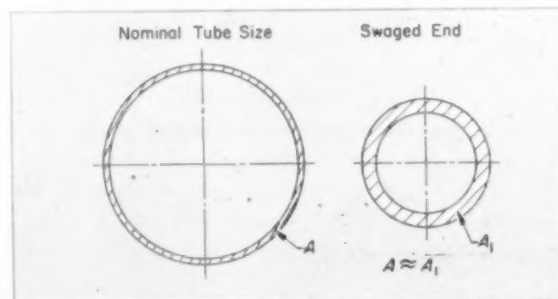
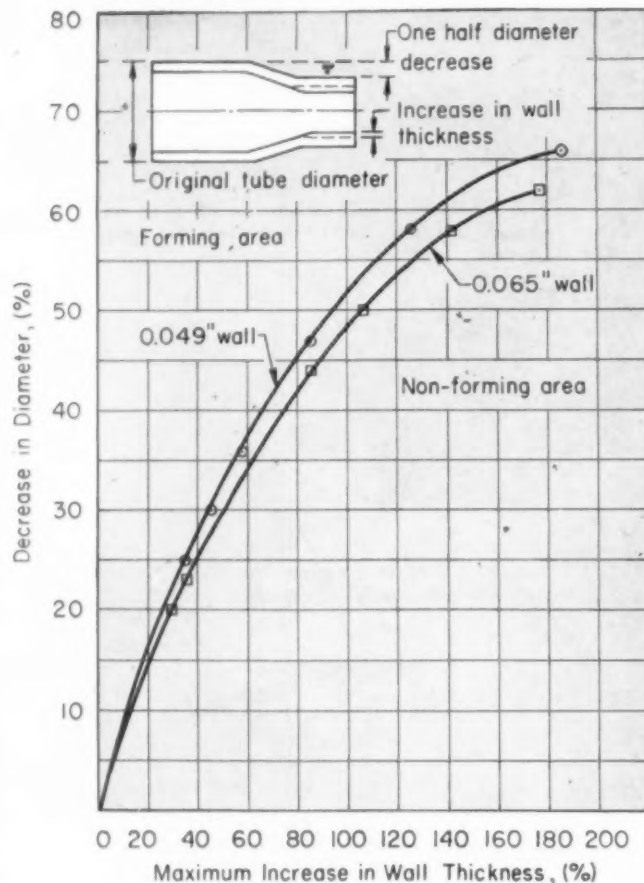


Fig. 11. With present swaging dies cross sectional area of swaged sections is approximately equal to unformed cross sectional area of tube.

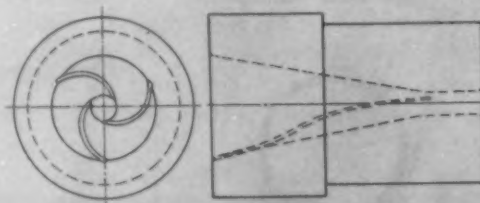


Fig. 12. In helical flute swage die, flutes extend through die.

niques, reduce die costs and provide wider design limits. In another approach to cost reduction of the tube swaging operation, different methods of tube swaging are being tested experimentally. For instance, an attempt was made to swage tubing in a standard cable swaging machine. Although this operation succeeded in swaging the tubes they were substandard due to noncircular inside diameter and a lack of consistent concentricity between the tube and its swaged end. It is believed that this undesirable condition was caused by insufficient support of the tube beneath the hammers of the cable swaging machine. Again, an effort was made to swage tubes in the turret lathe with an adjustable swage die, Fig. 7. This experiment also failed to produce a swaged tube that was sufficiently round for production.

Greater Reductions Secured

After these two failures, attention was again directed toward redesigning the production swage die used so successfully for tube junctions. In the opinion of tool engineers associated with this operation, reducing friction was the important problem in the new application. Subsequently a die was developed to change the configuration of the transition area by extending the flutes the full length of the die, Fig. 8.

The effect of the new flutes is outstanding, permitting swage reductions up to 65 percent using two dies and without anneals, compared to the previously accepted limit of 40 percent. The flutes appear to allow more free circulation of oil and provide less rubbing area. Tests have shown that they grip the material, Fig. 9, in such a manner as to "knead" it as the die rotates.

In addition, a substantial tube thickening, which can be depended upon in the swaged end, is accomplished. This is of value, for example, in actuating rod applications. The accompanying curve indicates what can be accomplished by using this die to swage 24S-0 tubing, Fig. 10.

Now the swaged ends of actuating rods can be designed for thickened ends and the overall weight of the rod is therefore reduced. Designers can call for a swaged tube to be completely closed, if necessary, the only consideration being that interstage anneals and more dies will be required where greater than 65 percent reduction is required. The designer can figure a minimum of 70 percent retention of cross-sectional area for swaged tube ends up to 65 percent tube reduction, Fig. 11.

The latest development on swage dies has been to conduct tests on a fluted die which has helical flutes extending only through the transition area, Fig. 12. Preliminary results indicate that there is less radial grain distortion through the transition area and that severe swaging operations are easier to accomplish without buckling the tube.

standard gear hobber

retooled for difficult tooth form

By Al Minetti*

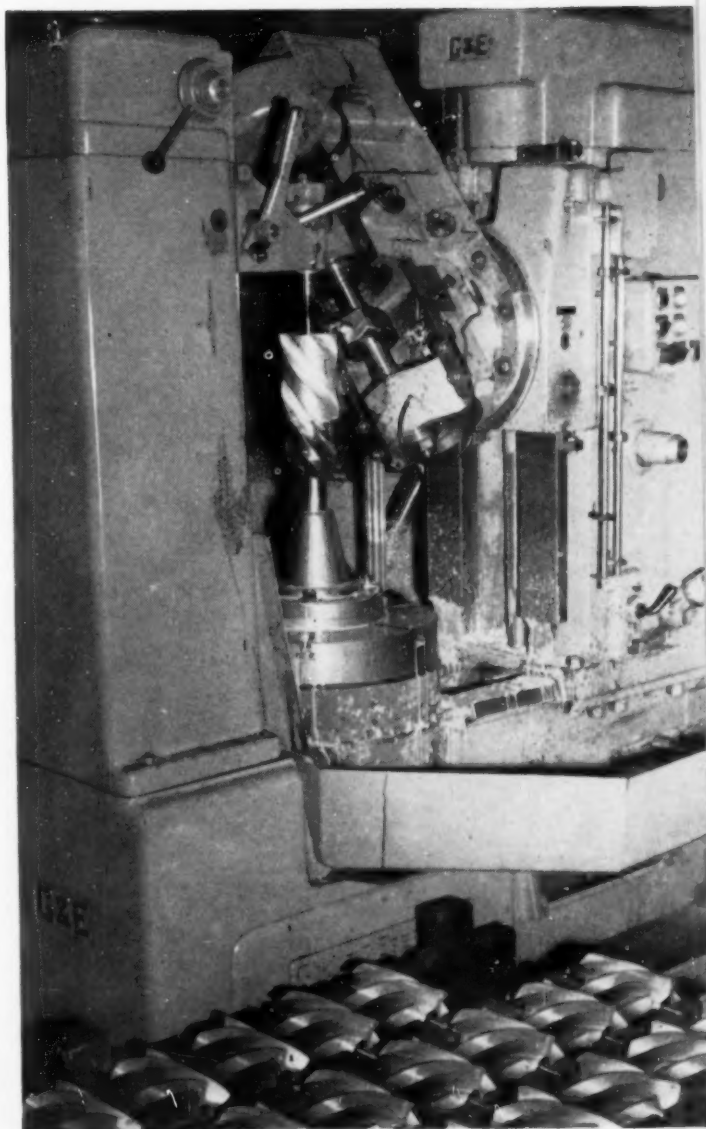
Harron, Rickard & McCone Co.
San Francisco, Calif.

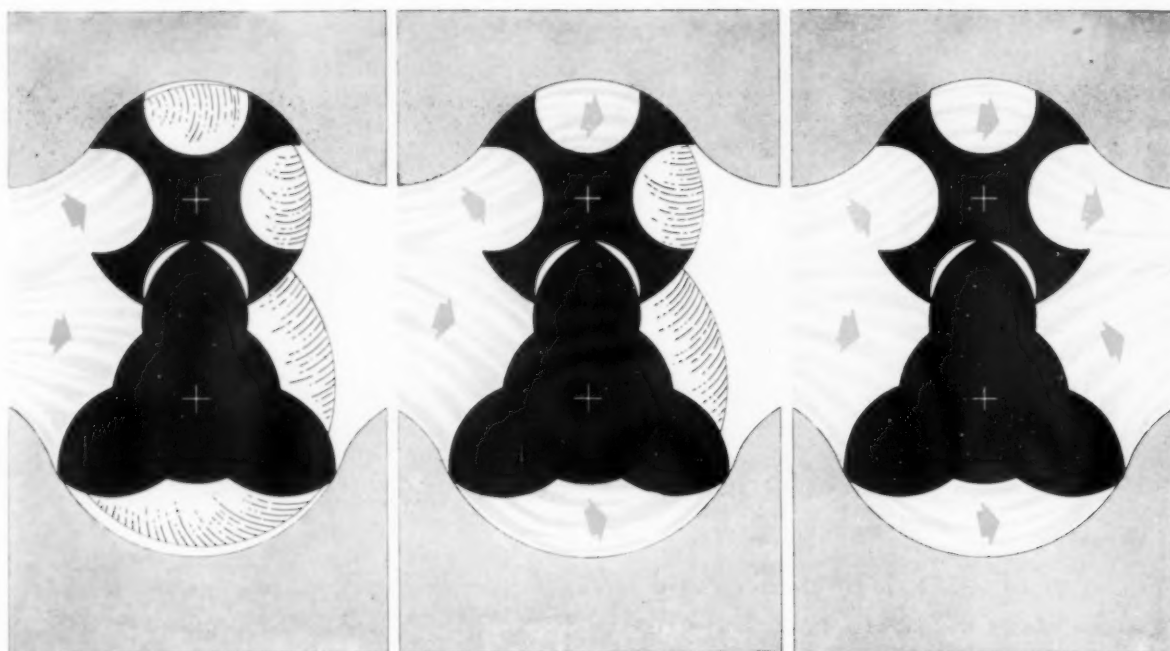
DESIGNED FOR EFFICIENCY and accuracy, and with only two moving parts, a proposed positive displacement rotary meter presented only one problem. Nobody knew how to manufacture the required rotors. The Ralph N. Brodie Co., San Leandro, Calif., developers of the design, presented the problem to gear machinery producers who looked on it as an impossible job. The rotor flutes are actually the addenda portions of teeth since the root diameters equal the pitch diameters. Developers of the meter decided they would have to solve the problem themselves by designing special tools for existing equipment.

First step was to present the problem to the company mathematician so he could develop a formula and plot a chart for the profile of a cutter that would give the necessary form to the rotor teeth. The cutter had to produce both cycloid and epicycloid tooth forms. An experimental cutter, made after initial calculations, did maintain a tooth form. With the plotting of closer coordinate points on the chart and the use of a large comparator, a tooth curve was obtained for the cutter that resulted in the desired shape and accuracy. Final accuracy of

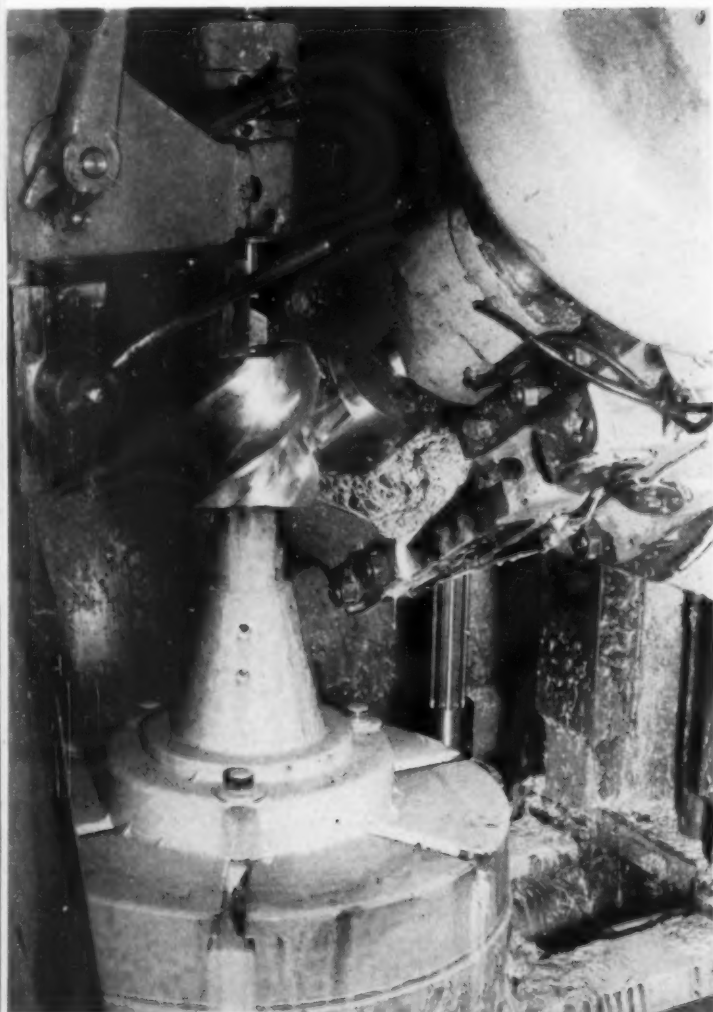
*Senior member ASTE Golden Gate chapter.

Standard gear hobber with special cutter forming flutes on four-flute rotor. Semifinished rotors are handled in special racks to prevent damage during transfer.





Drawings illustrate operating principle of meter. Fluid enters spiral flutes of rotors, causing them to revolve. An exact volume of liquid is momentarily isolated from inlet and outlet. Fluid is then released to flow down stream.



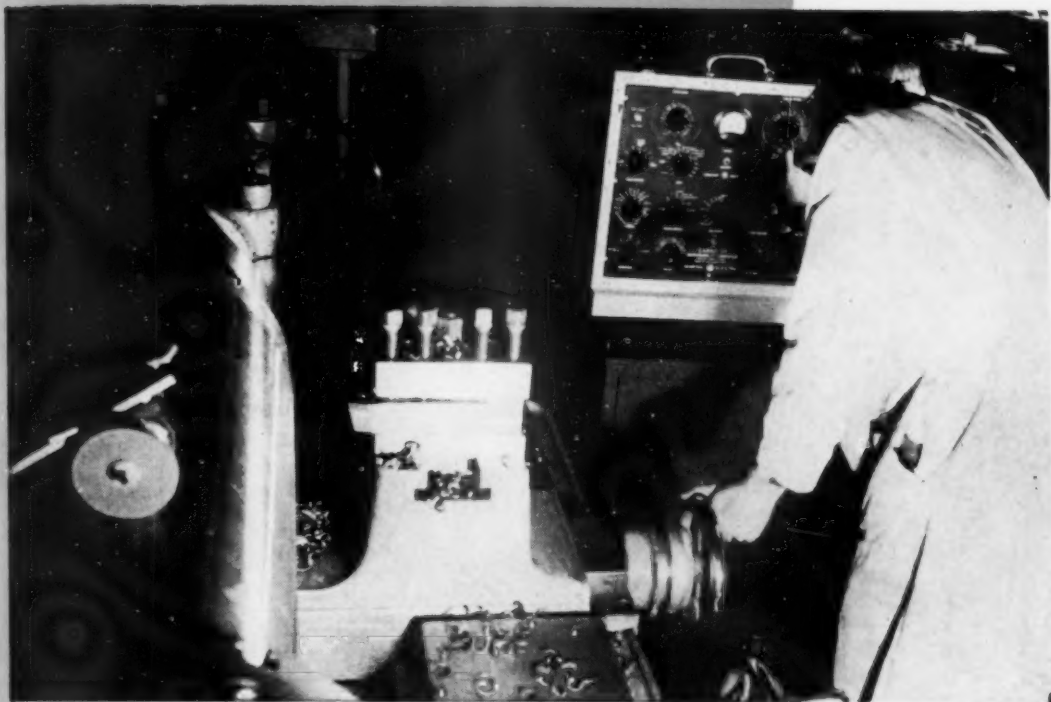
Close-up of three-flute rotor being machined. Lapped centers in integral shafts permit close positioning of the workpiece.

the tooth form is closely held including allowable errors for tooth form, space, lead, tooth thickness and root diameter.

To operate correctly, the meter must be hydraulically unbalanced but, for smoothness, the components must be in mechanical balance at all times. Hydraulic unbalance is achieved by use of rotors with different numbers of teeth. Smoothness and accuracy are achieved by carefully mounting the rotor shafts in precision bored holes in the housing. Clearance between the rotors is held to a minimum.

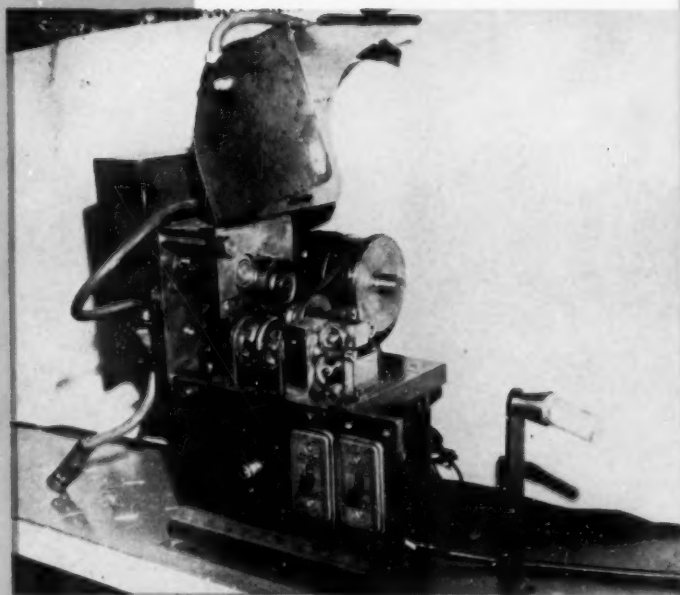
Roughing and finishing of the spiral tooth forms are performed on a standard 24H Gould & Eberhardt gear hobber. Aluminum rotors are cast with their shafts as inserts. Centers of the shafts are lapped so units can be accurately positioned during succeeding operations. The outside diameters and the faces of the rotors are semifinished. Next, the teeth are rough milled and the shaft is given a rough grind. The teeth are then cut to finished size. Ports are milled at both ends of the rotor. Finishing of the rotors is completed by turning the outside diameter to size, and grinding the tooth forms and shafts.

Successful production of these difficult parts on a standard machine represents another example of tool engineering ingenuity. It also indicates that an open-minded approach to seemingly impossible production problems can lead to comparatively simple solutions using existing equipment.



MACHINABILITY computer quickly determines optimum conditions for setting up machining operations. Developed by Dr. W. W. Gilbert and Carboloy engineers, the device can be fed information on any of 19 operational variables and in less than 2 minutes will give the answer to the unknown variable. Answers are based on use of feeds, cuts, tool grades and geometry which result in normal wear-type cutting edge failure.

AUTOMATIC production of relay contact fingers is secured with this special machine built by IBM. Wire is fed from a reel through a straightener and into a die where it is cut to length. A pair of gripper fingers pick up the wire form and form an offset *V* at one end. Shanks are held within 0.003-inch straightness at a production rate of 240 forms per minute. Stock is a special silver alloy supplied by Handy & Harman, N. Y.



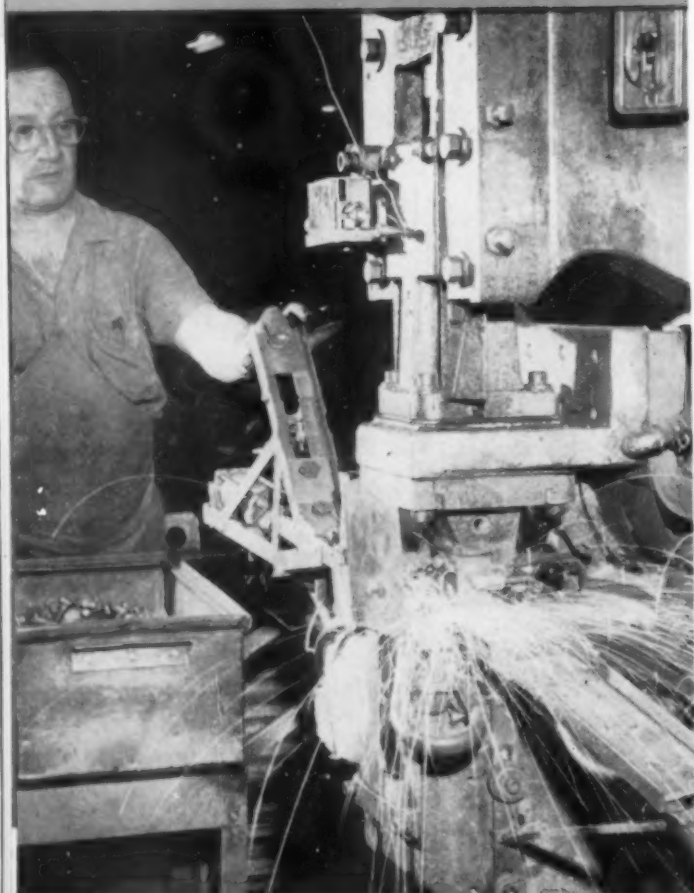
TOOLS at work

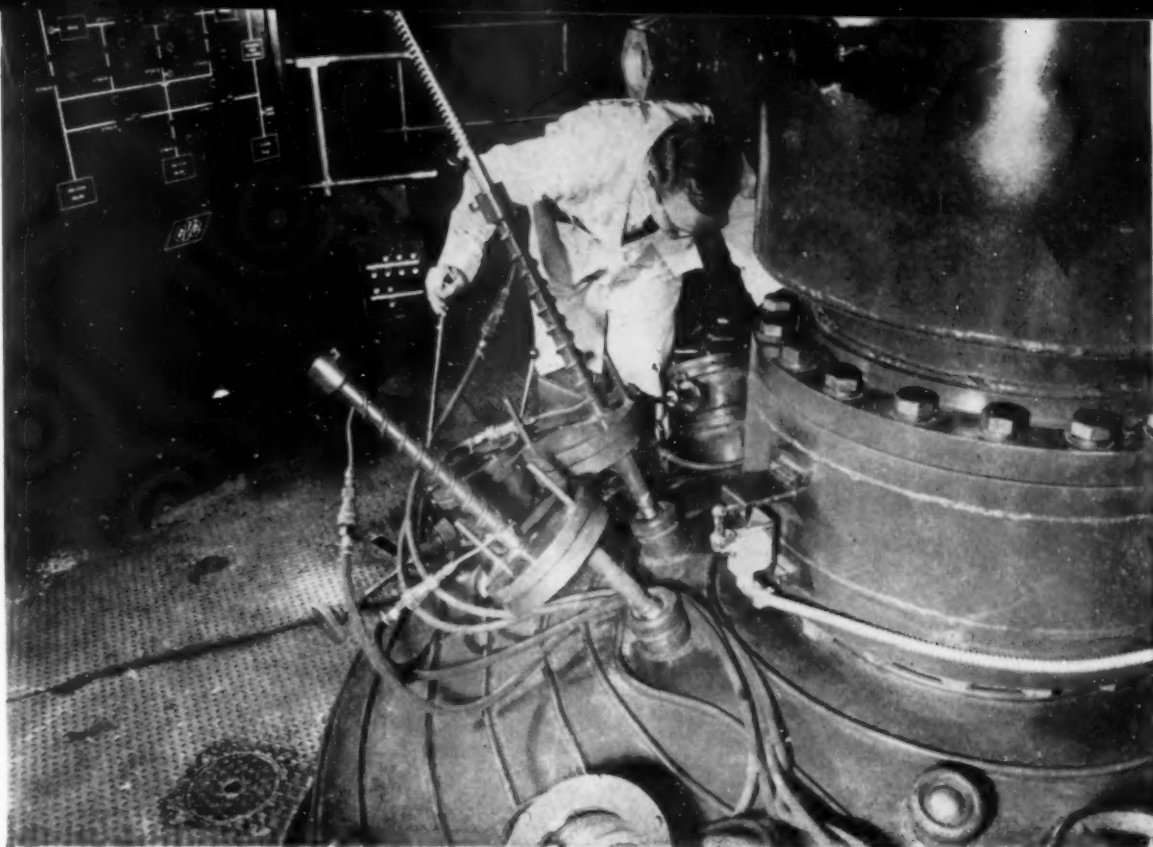


REAR BUMPER BRACKET is formed in mechanical press in critical operation at Buick plant in Flint. Since projection welding is used to join plate and bolt assembly to bracket, the flanges must be held to a few thousandths so all projections will be in same plane.

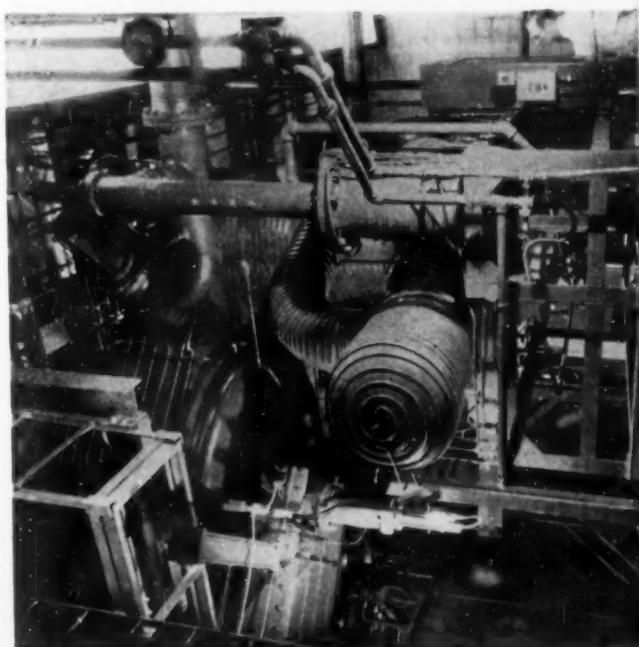
Semiautomatic projection welding operation attaches bolt to top plate for bumper bracket. Bolt with projections on head is assembled through hole in plate and placed on feeding chute. Assembly slides down chute, its weight trips limit switch actuating weld machine. After operation feed indexes another assembly into weld position.

In final assembly operation sub-assembly of plate and bolt is placed in top platen die of welder; formed bracket is placed in bottom die for joining by projection welds. Secure joint is obtained.





SEMICONTINUOUS vacuum furnace, a pilot production unit, completes a melt of special high-temperature alloy of improved physical properties and consistency. Bell-shaped ingot chamber is evacuated and operator is tilting furnace for pouring. Furnace is 960-cycle induction type, with a vacuum chamber for charging, the vacuum furnace itself and a vacuum bell containing four ingot molds. In this way a continuous vacuum is maintained in furnace. Air is evacuated from the new Carboly vacuum melting installation by three pumps. Diffusion pump in foreground drops pressure to less than one micron.



TOOLS at work

POWER-OPERATED NAIL PULLER

**saves
TIME
and
EFFORT**

By Burnell C. Stambaugh
Hanover Tool and Specialty Works
Hanover, Pa.



Fig. 1. Power-operated nail puller reduces operator fatigue and minimizes operation costs.

INDUSTRY has long been faced with the problem of extracting nails from crates and crating material in an economical manner. Usually the process has involved the use of manually operated pulling devices. If a large quantity of crates is to be opened, the cost involved may become excessive. Such was the case when a large corporation was faced with the necessity of uncrating previously packaged units to make engineering changes prior to shipment.

Because of the quantity of units involved, the special nail puller illustrated in Fig. 1 was developed for this special job. Its use proved so successful that the costs were minor for the uncrating job that otherwise would have been prohibitively costly. This specially developed nail puller, shown in section in Fig. 2, consists of a pneumatic impact hammer which is used to drive the gripping jaws into the wood on each side of the nailhead.

To close the jaws onto the body of the nail, an air cylinder and piston, surrounding the hammer, is actuated at the end of the driving stroke. This cylinder then retracts the gripping jaws, withdrawing the nail in a straight line. The procedure minimizes damage to the crate, leaves the nails in a reusable condition and prevents damage to the contents of the crate.

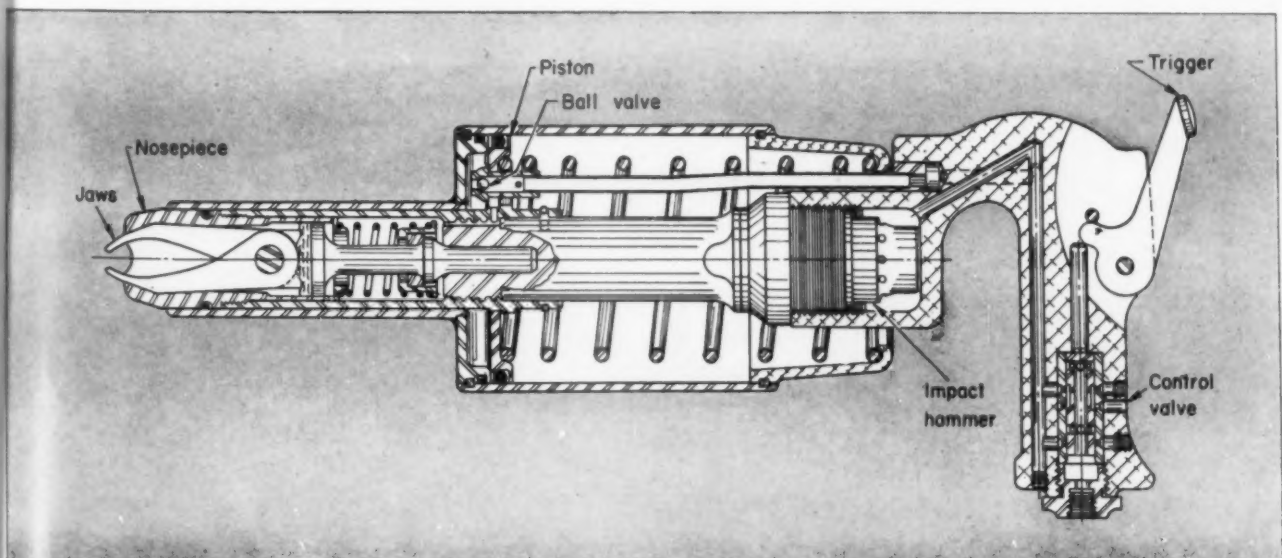
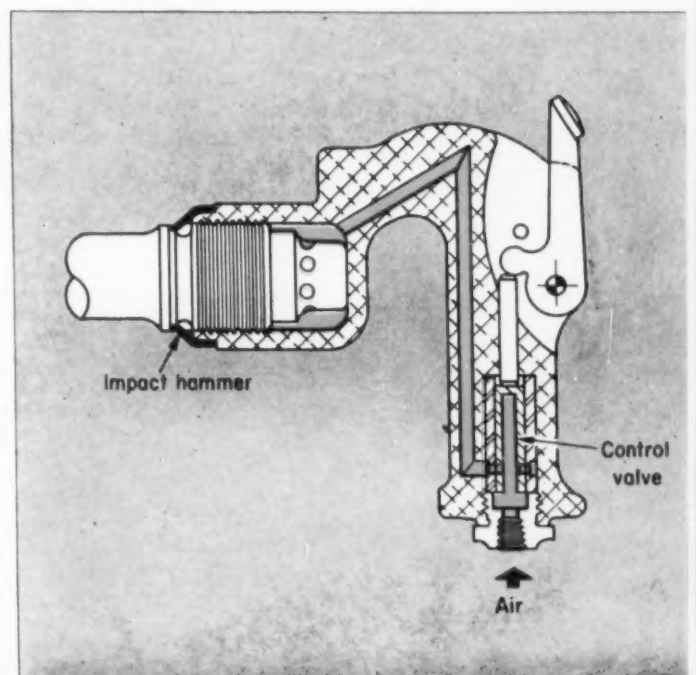
Operation is fast for it is possible to remove nails in about half the time required for previous methods. Also, operator fatigue is lessened because

the manual effort associated with pulling nails is eliminated. The operator only places the unit in position and operates the trigger. Weighing about eleven pounds, the unit can be supported by a counterbalance when used along an assembly line.

One of the most convenient features incorporated in the design of this tool is the single-valve control for the entire nail pulling operation. This valve is positioned by a button on the tool grip in a convenient location under the operator's thumb. When the button is depressed half way, the hammering operation is accomplished. When the jaws have been driven a certain depth, the button is pushed to its second position. This stops the ham-

Fig. 2. (below) Sectional drawing showing operating features of nail puller, including control valve, porting, hammer, pistons, jaws and nosepiece.

Fig. 3. (right) Control valve in position for delivering air to impact hammer. This drives jaws into wood on each side of the nail.



mering operation, closes the jaws and withdraws the nail. Release of the button exhausts the cylinder, returning the mechanism to its original position. Cycle of operations is illustrated in Figs. 3, 4 and 5, showing the porting and action of the nail puller.

To make the unit compact and light in weight for easy handling, many engineering problems had to be solved. The extracting jaws had to be small to minimize damage to crating material yet strong enough to grip and pull the nail. These problems were aggravated by the action of the pneumatic hammer which presented fatigue problems on the

various internal components of the tool. Ease of handling was another problem which was solved through the use of the single trigger. Also, it was necessary to provide a design of the jaws and nosepiece which would allow good visibility of the nailhead when placing the tool in position.

Main components of the tool are assembled by the use of retaining rings, thereby eliminating screws which would loosen due to the action of the impact hammer. All wear parts in the valve are hardened and ground tool steel parts, and held to close dimensional tolerances. The pneumatic pistons are sealed with neoprene O-rings.

Fig. 4. Control valve in second position admits air behind main piston. Retraction of the nosepiece closes the jaws on the nail. Continued retraction withdraws the nail into the unit.

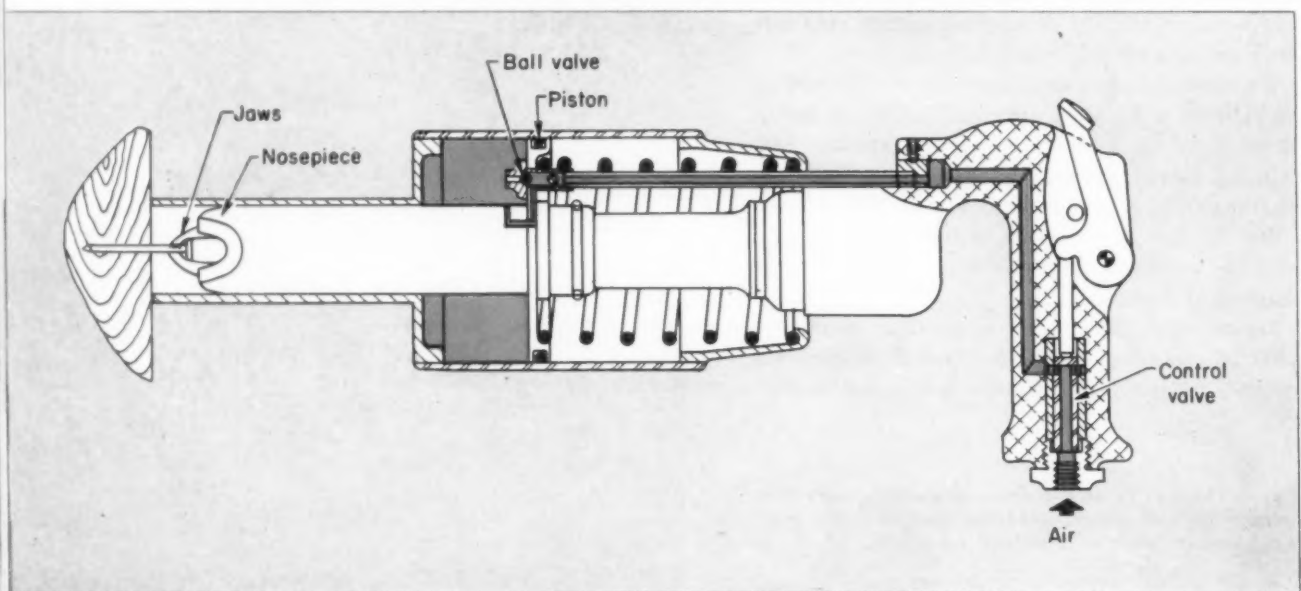
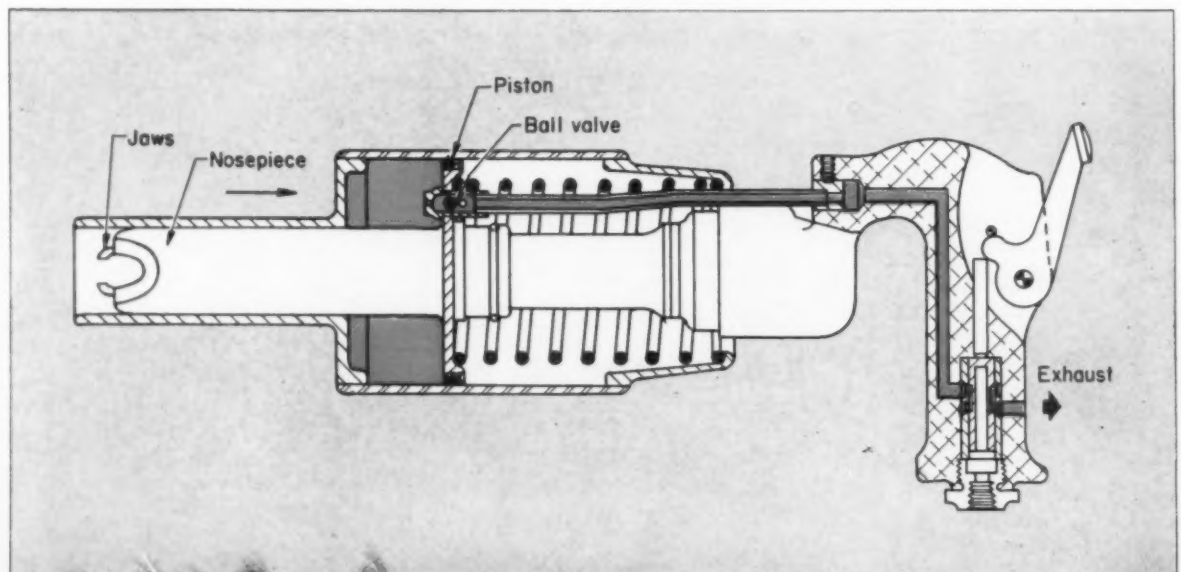


Fig. 5. Released trigger position. When air pressure is removed ball valve opens to exhaust air, jaws open to release nail and piston returns to original position shown in Fig. 2.



speeds and feeds

for cutting stainless steels

BECAUSE ALL STAINLESS STEELS cannot be machined at the same feeds and speeds, and because even the steels classified in the three basic groups have different machining characteristics, these tables have been compiled to indicate a good starting point when counterboring, boring and trepanning.

Speeds and feeds indicated in these tables are approximate, having been based on the use of HSS tools, an average tool life of 8 hours and general run of parts. Listed figures must be changed to compensate for conditions of part, design, finish requirements, coolant and machine.

Counterboring

These speeds and feeds are for counter bores having four flutes. For counterbores having only two flutes, speeds and feeds should be decreased 15 to 20 percent. For a single cutting edge, they should be decreased 40 to 50 percent.

AISI Type (No.)	Tool Dia (inches)	Width of Chip (inch)											
		1/32		1/16		3/32		1/8		3/16		1/4	
		Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)
416 430F	0.375	140	0.0024	140	0.0022	138	0.0025	134	0.0024	134	0.0030	134	0.0032
	0.500	140	0.0028	140	0.0026	140	0.0032	136	0.0031	134	0.0030	134	0.0032
	0.750	142	0.0033	142	0.0032	140	0.0032	136	0.0031	134	0.0030	134	0.0032
	1.000	145	0.0039	145	0.0037	143	0.0036	139	0.0035	136	0.0034	134	0.0032
	1.500	148	0.0045	148	0.0043	146	0.0042	142	0.0041	139	0.0040	137	0.0040
303	0.375	95	0.0028	95	0.0026	95	0.0028	91	0.0027	90	0.0030	90	0.0030
	0.500	97	0.0032	97	0.0030	95	0.0032	91	0.0031	90	0.0030	90	0.0030
	0.750	100	0.0035	100	0.0033	98	0.0033	94	0.0031	90	0.0030	90	0.0030
	1.000	104	0.0041	104	0.0039	102	0.0037	98	0.0036	94	0.0033	90	0.0030
	1.500	106	0.0048	106	0.0046	104	0.0043	100	0.0042	98	0.0040	95	0.0038
430 410 405 403 446	0.375	65	0.0019	65	0.0017	63	0.0018	60	0.0017	57	0.0019	58	0.0020
	0.500	65	0.0022	65	0.0020	63	0.0021	61	0.0020	57	0.0019	58	0.0020
	0.750	67	0.0025	67	0.0023	65	0.0021	61	0.0020	57	0.0019	58	0.0020
	1.000	72	0.0028	72	0.0026	70	0.0024	66	0.0023	62	0.0021	58	0.0020
	1.500	74	0.0030	74	0.0028	72	0.0025	68	0.0024	64	0.0022	60	0.0021
431 414 420 420F	0.375	60	0.0022	60	0.0020	58	0.0021	55	0.0020	52	0.0021	50	0.0021
	0.500	60	0.0025	60	0.0023	58	0.0021	55	0.0020	52	0.0021	50	0.0021
	0.750	62	0.0028	62	0.0026	60	0.0024	56	0.0023	52	0.0021	50	0.0021
	1.000	64	0.0031	64	0.0029	62	0.0027	58	0.0025	54	0.0023	50	0.0021
	1.500	68	0.0033	68	0.0031	66	0.0029	62	0.0028	58	0.0026	54	0.0024
301 302 304 309 316 321 347	0.375	56	0.0024	56	0.0022	54	0.0023	51	0.0022	48	0.0023	46	0.0023
	0.500	56	0.0027	56	0.0025	54	0.0023	51	0.0022	48	0.0023	46	0.0023
	0.750	58	0.0030	58	0.0028	56	0.0026	52	0.0025	48	0.0023	46	0.0023
	1.000	60	0.0033	60	0.0031	58	0.0029	54	0.0027	50	0.0025	46	0.0023
	1.500	63	0.0035	63	0.0033	61	0.0030	57	0.0029	53	0.0027	49	0.0025
440A 440B 440C 440F	0.375	52	0.0020	52	0.0018	50	0.0019	47	0.0018	45	0.0018	43	0.0018
	0.500	52	0.0023	52	0.0021	50	0.0019	47	0.0018	45	0.0018	43	0.0018
	0.750	55	0.0025	55	0.0023	53	0.0021	50	0.0020	47	0.0018	43	0.0018
	1.000	57	0.0027	57	0.0025	55	0.0023	52	0.0021	47	0.0020	43	0.0018
	1.500	60	0.0029	60	0.0027	58	0.0025	55	0.0023	50	0.0021	45	0.0020

Data Courtesy Cleveland Automatic Machine Co., Cincinnati, Ohio

REFERENCE SHEETS

Boring

Listed feeds and speeds are applicable for a depth of cut from 0.006 to 0.012 inch per revolution, depending on the rigidity of the bar and the depth of bore. Boring bars should be as short and rigid as possible, using the largest diameter that will permit chip elimination.

Boring Bar Dia (inch)	AISI Type (No.)															
	416		430		303		430	410	405	431	414	301	302	304	440A	440B
							403		446	420	420F	309	316	321	440C	440F
	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)
1/4 ^o	132	0.0020	105	0.0018	95	0.0017	90	0.0016	70	0.0015	65	0.0013				
3/8 ^o	132	0.0022	105	0.0020	95	0.0019	90	0.0018	70	0.0017	68	0.0015				
1/2 ^o	136	0.0025	108	0.0023	100	0.0022	95	0.0021	75	0.0020	75	0.0018				
3/4	140	0.0030	110	0.0028	105	0.0025	100	0.0025	80	0.0023	80	0.0020				
1	145	0.0042	115	0.0040	110	0.0038	105	0.0035	85	0.0032	83	0.0030				
1 1/4	150	0.0060	120	0.0058	115	0.0055	110	0.0053	90	0.0050	85	0.0045				

*Bars denoted may require depth of cut to be reduced. For deeper cuts where the boring bar is more rigid, feeds may be increased 0.0005 inch per revolution for every increase of 0.020 inch in the depth of cut up to 1/8-inch maximum depth of cut.

Trepanning

When trepanning with single point or bit type tools, use the listed speeds and feeds. When circular or spiral-relieved type tools are used, speeds and feeds listed for counterboring are applicable.

AISI Type (No.)	Hole Dia (inches)	Width of Chip (inch)											
		1/32	1/16	1/8	1/4	3/8	1/2	5/8	3/4	7/8	1 1/8	1 1/4	1 1/2
		Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)	Speed (sfm)	Feed (ipr)
416 430F	0.500	140	0.0015	138	0.0014	134	0.0014	134	0.0016	132	0.0015	132	0.0015
	1.000	140	0.0019	138	0.0018	136	0.0017	134	0.0016	132	0.0015	132	0.0015
	1.500	142	0.0023	140	0.0022	138	0.0021	136	0.0020	134	0.0019	132	0.0015
	2.000	145	0.0027	143	0.0026	141	0.0025	138	0.0024	136	0.0023	134	0.0022
	2.500	148	0.0030	145	0.0029	143	0.0028	140	0.0027	138	0.0026	136	0.0025
303	0.500	95	0.0017	93	0.0016	91	0.0016	91	0.0018	89	0.0017	89	0.0018
	1.000	97	0.0021	95	0.0020	93	0.0019	91	0.0018	89	0.0017	89	0.0018
	1.500	100	0.0025	98	0.0024	96	0.0023	94	0.0022	92	0.0021	90	0.0018
	2.000	104	0.0029	102	0.0028	98	0.0027	96	0.0026	94	0.0025	92	0.0022
	2.500	106	0.0032	104	0.0031	102	0.0030	98	0.0029	96	0.0028	94	0.0027
430 410 405 403 446	0.500	65	0.0007	63	0.0006	61	0.0005	61	0.0008	59	0.0008	59	0.0010
	1.000	67	0.0011	65	0.0010	63	0.0009	61	0.0012	61	0.0011	59	0.0010
	1.500	69	0.0015	67	0.0014	65	0.0013	63	0.0016	63	0.0016	61	0.0015
	2.000	71	0.0019	69	0.0018	67	0.0017	65	0.0019	65	0.0018	63	0.0018
	2.500	73	0.0022	71	0.0021	69	0.0020	67	0.0024	67	0.0024	65	0.0023
431 414 420 420F	0.500	60	0.0006	58	0.0005	56	0.0005	56	0.0008	54	0.0007	54	0.0009
	1.000	62	0.0010	60	0.0009	58	0.0009	56	0.0011	56	0.0010	54	0.0009
	1.500	64	0.0014	62	0.0013	60	0.0012	58	0.0015	58	0.0014	56	0.0014
	2.000	66	0.0018	64	0.0017	62	0.0016	60	0.0018	60	0.0018	58	0.0017
	2.500	68	0.0021	66	0.0020	64	0.0019	62	0.0024	62	0.0023	60	0.0022
301 302 304 309 316 321 341	0.500	56	0.0015	54	0.0014	52	0.0013	52	0.0015	50	0.0015	50	0.0015
	1.000	58	0.0018	56	0.0017	54	0.0016	52	0.0018	52	0.0017	50	0.0015
	1.500	60	0.0021	58	0.0020	56	0.0019	54	0.0022	54	0.0021	52	0.0020
	2.000	62	0.0025	60	0.0024	58	0.0023	56	0.0025	56	0.0024	54	0.0023
	2.500	64	0.0028	62	0.0027	60	0.0026	58	0.0027	58	0.0026	56	0.0025
440A 440B 440C 440F	0.500	52	0.0011	50	0.0010	48	0.0009	48	0.0011	46	0.0010	46	0.0010
	1.000	54	0.0014	52	0.0013	50	0.0012	48	0.0015	48	0.0014	46	0.0015
	1.500	56	0.0018	54	0.0017	52	0.0016	50	0.0018	50	0.0018	48	0.0018
	2.000	58	0.0021	56	0.0020	54	0.0019	52	0.0022	52	0.0021	50	0.0020
	2.500	60	0.0023	58	0.0022	56	0.0021	54	0.0024	54	0.0023	52	0.0022



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featured

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ASTE's tenth student charter was presented by Richard A. Smith, right, a national director, to Chairman Raymond Kisiel, second from left. Also shown are Lawrence L. Jarvie, left, of the State University of New York, and Albert V. Payne, president of Mohawk Valley Technical Institute.



Student Chapter Formed at

Mohawk Valley Technical Institute

Getting back into the autumn swing of classes will have added meaning for the 42 members of the newly established student chapter at Mohawk Valley Technical Institute at Utica, N. Y., who will be holding their first technical session since receiving the ASTE charter in June.

Chartering ceremonies, held June 15 at the Club Monarch, were conducted by Richard A. Smith, a national director of the Society. He presented the ASTE charter and installed the chapter officers.

Serving the group during the next school year are: Raymond Kisiel, chairman; Walter Fitzgerald, first vice chairman; Ignatius Saba, second vice chairman; John A. Barclay, Jr., treasurer; and Francis T. Banas, secretary.

Principal speakers on the program included: Dr. Lawrence L. Jarvie, executive dean for institutes and community colleges of the State University of New York; Albert V. Payne, president of Mohawk Valley Technical Institute; and Nicholas A. Kinney, instructor in machine tool operation and faculty advisor to the student chapter.

Toastmaster at the dinner was Ernest J. Masucci, a former instructor now with Bendix Aviation Corp. Raymond Hurley, chairman of the Mohawk Valley senior chapter, presented the membership pins and Earl K. English, past chairman of the Mohawk Valley chapter, presented a check from national headquarters. All three were instrumental in the formation of the new chapter.

Space Assignments Under Way for ASTE Exposition

With approximately 400 firms already scheduled to exhibit in next year's Industrial Exposition, ASTE has begun issuing space assignments for what promises to be the largest exposition in its history. The event will be held March 19 through 23 in Chicago's International amphitheatre.

Making specific assignments of space so far in advance of an ASTE exposition is unprecedented and is due to pressure from exhibitors who want to get the ball rolling on planning their exhibits, according to

Harry E. Conrad, executive secretary of the Society.

At the rate space requests are coming in, an early sellout is indicated, Mr. Conrad said. More than 300 companies sent in their reservations less than a month after the first announcement was made on June 1.

Space reservations and assignments are being handled through the ASTE Industrial Exposition office in the Society's national headquarters building, 10700 Puritan Ave., Detroit 38, Mich.

Industry Is Full Partner in ASTE Research Fund Projects

All projects of the ASTE Research Fund Committee will result in practical results if careful planning, competent personnel and high interest mean anything. Since many research projects have been known to add to the supply of information without providing immediately usable results, the Research Fund Committee has taken an unusual approach to project evaluation and control. Their answer has been a steering committee for each project.

Basically, a steering committee is composed of one member of the Research Fund Committee, the research director of the Fund and from 5 to 12 members representing suppliers, users and interested technical groups. Individuals who possess knowledge of and interest in the subject under investigation are invited to serve on a committee. When individuals with specific points of interest are not known, a leading company may be invited to send a representative. Membership in ASTE is not a requirement for steering committee service.

Chronologically, a steering committee is organized before a research project is activated. Normally, a proposal for a particular area of investigation is directed to the Fund Committee. The committee members discuss the need for such a project based on their personal experiences and such information as can easily be obtained from industry by the research director. The Fund Committee then decides that the subject investigation should not be followed or that it deserves further study.

When a decision is reached to proceed, a steering committee is set up. A group of individuals is asked to meet and consider the merits of the project. Frequently, the person who would act as project supervisor for the contracting party sits in on this meeting to add clarification to the proposal.

This group is asked to recommend to the Research Fund Committee the proper course of action. The group may also recommend that the project does not warrant investigation in light of the limited value of the information that might be obtained. It has already happened that the subject proposal was not particularly valuable but the group recommended continuance in a different phase of the same field. If the group recommends continuing a project, individuals are requested to continue as members of the project steering committee. At some time during this meeting, the steering committee organizes itself, selects its chairman and delegates functions, tasks and authority. Continuity of Research Fund policies is assured by the active presence of a Fund Committee member and the research director.

An operating steering committee is obliged to keep in touch with its project. It can offer advice to the project leader or the Fund Committee. Such contact insures that the project will continue toward the predetermined goal and not wander off on related topics (which might properly be recommended as subjects for individual or follow-up investigation.) The steering committee assists in pointing the project toward practical results. If the steering committee sees the project is heading for a blind alley, it can suggest major changes or abandonment to the Fund Committee. Constructive criticism of research reports is also a steering committee activity. The steering committee acts as a governor to curb investigative exuberance and keep it directed toward practical results.

In addition, the steering committee, or any of its members, acts as the clearing house for any ideas concerning a project. Individuals or companies who are interested in a particular subject may contact

the steering committee to determine the area of investigation to prevent duplication of effort or to be sure that certain phases have not been overlooked. Industries not represented on the committee can thus maintain their partnership.

Frequently, when a company has enough interest in a project to make a man available for service on a steering committee, it goes further by helping to finance the project. There is, however, no connection between steering committee membership and financing of projects except as individual companies evaluate the results possible from a particular investigation.

At the present time, ASTE Research Fund partnerships with industry, through active steering committees, number six. Each project has its own functioning steering committee and individual project interests include: metal cutting, boride tool materials, fog application of cutting fluids, plastic tooling, and punch and die clearances.

Why Register?

Important reasons why qualified tool engineers should strive to become registered professional engineers have been compiled by George Julien, member of the ASTE National Professional Engineering Committee.

While his complete report is now in the hands of all chairmen of chapter professional engineering committees, a summary is published here for the benefit of everyone in ASTE.

Perhaps the top reason for becoming a registered professional engineer is the increased opportunity for advancement. An industry survey by the National Council of State Boards of Engineering Examiners indicates that corporations are increasingly giving preference for positions to registered engineers, all other qualifications being equal.

The architectural acts of some states specify that no one may design anything attached to any building who is not registered as an architect or engineer. It is certainly well known that passing the professional engineering examinations is a legal requirement for becoming a consulting engineer.

In fact, many states have so-called permissive laws, which, if enforced, would prevent nonregistered engineers from practicing at all or using the title "engineer."

It is not possible, within the law, for a person to advertise or publicly represent himself as an expert engineer, or to testify in patent cases, unless he is registered. And generally speaking, nonregistered individuals cannot sue for services rendered as engineers.

Tool Engineering Institute at University of Wisconsin

Sept. 21 through 23 have been set aside for the annual Tool Engineering Institute at the University of Wisconsin. The three-day event will be sponsored by the University Extension Division in cooperation with the College of Engineering and the Madison chapter of ASTE.

The program offers a series of nine lectures on timely engineering topics as well as a special dinner meeting arranged by Madison ASTE members.

Registration will begin at 8:30 am on Wednesday, opening day. After a welcome by university officials, a discussion on small run blanking dies will be given by Dayton Rogers, president of Dayton Rogers Mfg. Co., Minneapolis.

New extrusion techniques will be covered by E. J. de Ridder, director of engineering development, Reynolds Metals Co., Louisville, Ky. The final session of the day will be presented by the president of the American Society for Metals, G. A. Roberts, vice president of Vanadium-Alloys Steel Co., Latrobe, Pa. He will speak on tool steels and their application.

On Thursday, institute participants will hear a discussion on drilling research by Carl J. Oxford, Jr., research engineer, National Twist Drill & Tool Co., Rochester, Mich., and a member of ASTE's National Education Committee.

A lecture on tool and die repair will be delivered by Richard Thuma, superintendent of the tools and maintenance dept., Allis-Chalmers Mfg. Co., Milwaukee. Low cost tooling for short-run production will be the subject of Leonard Mueller, engineer with Ohio Chemical & Surgical Equipment Co., Madison, Wis.

The closing day of the institute will feature discussions on: presswork problems by Melvin D. Verson, executive assistant, Verson Allsteel Press Co., Chicago; plastic tooling by R. M. Houghton, president of Houghton Laboratories, Olean, N. J.; and new trends in tooling from L. J. Schnitzer, Inland Engineering, Inc., Chicago.

Additional information on the institute program can be obtained by writing Ralph D. Smith, Institute Coordinator, Extension Division, University of Wisconsin, Madison 6, Wis.



CHAUTAUQUA-WARREN—Top honors in the chapter's horseshoe tournament held at the annual picnic were taken by Harold Sigworth, upper left. W. R. Finch, upper right, was the runner up. Semifinalists were Paul Ballard lower left, and Norman Wetter.

Summertime Brings ASTE Outings

A sure sign of summer is the round of field days, picnics, golf tournaments and outings staged by ASTE chapters. First reports of this year's events prove again that members work just as hard at this type of activity as they do at their technical sessions throughout the meeting season.

Hamilton District chapter held its 14th annual field day on June 2 at Glendale Golf and Country Club. Golf, a putting contest, horseshoes, nail driving and dart throwing were the featured attractions for 217 members and guests.

Various golfing honors went to Leo Kempa, R. Povlitz, Nick Stout, Dick Ellis, R. J. McPherson, H. Lush, G. Watts, and Alex Taylor. Horseshoe experts were G. Robbins, J. Homes, R. Bolton and L. Evans. Roast-beef dinner and prize awards wound up the day's activities.—*W. A. Marcellus*

A day of fun was in order for **New Haven** members who spent Saturday, June 11 at F. W. Gilbert's country place at Mt. Carmel. Outing chairman Barry Burr and his committee planned a variety of activities for the program, including volley ball, softball, golf, horseshoes, quoits and other games.

Working on arrangements were: Dave Mathewson, John Brozek, Al Matthewson, Fred Dawless, Al Pollard, Norman Schuster, George Griffith, Joe McCary, Bill Nobel and Jim Kalleher.—*Silas W. Becroft, Jr.*

Chautauqua-Warren chapter's annual picnic took place on June 18 at Specer's Barn. In addition to a horseshoe tourney, activities included golf at Maplehurst Golf Course and an egg-throwing contest. Tony Demambro and Dick Freeman entered the lowest golf scores. Egg-throwing champions were Don Curtis and John Burling. Smorgas-

bord was served at 5:30 p.m., followed by the awarding of prizes.

Responsible for organizing the event was Program Chairman Elbert W. Garrison, who was assisted by Milt Johnson, Morrie Anderson, Dick Freeman and Harry Carlson.—*Walter N. Carlson*

A crowd of 280 members and guests turned out for **Tri Cities** annual picnic on June 4. Held at Little's Grove, the day's program included a full sports agenda. Dinner and the presentation of prizes contributed by affiliate members concludes the activities.—*Don Sheury*

Preceded by a tour of the Acushnet Process Co., the annual outing of

Southeastern Massachusetts was held June 11 at Gaudette's Pavilion at Acushnet, Mass. Sports, including golf, horseshoe pitching and softball, preceded the much anticipated clambake. Prizes were awarded to many members and guests in the crowd which attended.—*Karl W. Nittel*

For **Racine** members, 415 of them, June 3 stands out as the date for their annual frolic at Ligget's Palm Garden at Browns Lake, Wis. Golfing and fishing started the program, which drew the biggest attendance in years.

After dinner, Chairman Bob Freres was in charge of the awarding of prizes contributed by friends of the chapter. Program Chairman James Vernon and his committee presented evening entertainment including vaudeville acts and card games.—*Alvin J. Michna*



HOUSTON—May 27 was the date of the annual golf tournament between the ASTE and ASM chapters. Representing the two groups here are Donald A. Wilson, left, ASM chairman, and Bill Hindman of ASTE.—*George Bo-Linn*



PHILADELPHIA—Nail driving was just one of the many contests staged June 4 at the annual picnic at the Rifle Club. More than 325 members and guests enjoyed the day's program which also featured dinner, dancing and prizes.—*S. A. Matthews*

A joint outing with ASM was enjoyed June 25 by **Worcester ASTE** members and guests. With about 100 persons participating, the day's program was held at Holden Country Club. Events included golf driving and hole-in-one contests, darts, plug casting, volleyball, softball, horseshoes, badminton and other sports activities.—*Ronald H. Mead*

Members and guests of the **Evansville** chapter gathered at Ruthenburg Field on July 11 for their annual stag picnic. Following a chicken supper and awarding of prizes, an evening of card playing and fellowship rounded out an enjoyable evening. John E. Race, immediate past chairman, was awarded the past chairman's pin by Chairman Carl Doughty.—*William H. Brooks*

Saginaw Valley chapter's annual outing was held this year at Rolling Greens Golf Club, with nearly 150 members attending. Part of the receipts from the event were set aside for a scholarship fund the chapter is establishing for promising high school graduates to encourage them to go into tool engineering.

The day's program included various sports events, including golf and horseshoe pitching, with prizes going to everyone present at the outing.

—*Kent B. Arnold*

Attendance of 140 members and guests marked **Dayton** chapter's annual picnic and golf party. Held at Walnut Grove Golf Club, the event took place on June 16. Top flight cooperation on the part of the weatherman helped make the day enjoyable.

Golfing events were followed by dinner at the clubhouse. Prizes, various games and entertainment capped the evening program. Arrangements were in the hands of Warren Braun and his committee members Ed Rhoades and Bill Miller.—*Robert Bleicher*

Members and guests of the **Portland, Ore.**, chapter met at Broadmoor Golf Course on June 20 for a day of golf. Chairman of the day's activities was Fred Mondin, past chairman of the chapter. Prize winners included: Don Haner, Verne Scholz, Hugh Shivers, Elmer Beers, Ron Anderson, Norm Warner, Don Campbell, Earl Vinal, and Fred Allen.

Lawrence H. Cook, area captain of the National Membership Committee, met with chapter officers on another evening to discuss increase of membership and attendance at meetings.—*Walter Brenneke*

Erie chapter's ninth annual picnic, held at Penelic Picnic Grove, attracted a crowd of 120. Food, fun, games and prizes was the order of the day with Past Chairman William Snook as chairman of the festivities and head



ROCKFORD—Jim Kelly, right, was the winner of the set of woods given away at the annual golf party held at Forest Hills Country Club. The presentation was made by golf pro Curly Williamson. More than 350 persons turned out for the event.—*Les Teachout*.

chef. Perc Murray won a portable power saw.—*D. J. Beecher*

The Chateau at Wyandanch, L. I., N. Y., was the scene of **Long Island** chapter's third annual picnic on June 4. Picnic Committee Chairman Howard Mills and his committee provided a program of softball between senior and student members, sack races, egg-tossing contests and nail driving demonstrations. Interest in the picnic was stimulated by a "mystery man contest." Approximately 200 members and guests enjoyed the social intermission in the chapter's technical programs.—*William H. Bruning*



TOLEDO—Golfers Roy Wagner, Wilbur Trowbridge, Karl Petersen and Robert Benner were among the 200 ASTE members and guests who participated in the annual outing held June 22 at Sunningdale Golf club. Medalist honors went to Dave Heinle who shot a one over par. The program, planned by Paul J. Connell, included dinner, awarding of prizes, and professional entertainment.—*Harold H. Krueger*

Alfred State Tech Installs New Officers

Installation of new officers was the highlight of the Alfred State Tech student chapter's annual spring steak roast held at Angelica, New York.

Gerald Sick, national delegate and immediate past chairman of the Rochester chapter, as well as a newly appointed member of the National Program Committee, installed the officers.

Taking the oath of office were: Tony Tomarchio, chairman; Dick Johnston, first vice chairman; Robert Dicks, second vice chairman; Jo Ann Blanz, secretary; and Stanley Gilbert, treasurer. Mr. Sick also presented a gavel to the chapter as a gift from the Rochester chapter. Ken Nutt, past chairman, was awarded the past chairman's pin by Chairman Tomarchio.

Other guests from Rochester chapter included: Chairman William Kamola, First Vice Chairman John Lawrence; Second Vice Chairman Clifford Sears; Third Vice Chairman Arthur Lang; Secretary Carl Greenman; and Treasurer Van Hansford. —*Jo Ann Blanz*

Muncie Chapter Tours Delco Remy Plant

Ninety members of the Muncie chapter traveled to Anderson, Ind., on May 24 to visit the Delco Remy plant. They viewed operations and saw many examples of tool engineering utilized in the manufacture of automatic distributors, coils, condensers and other automobile parts.—*Darrell Marks*

Nebraska Chapter Sponsors 30-Week Course

An intensive tool and die engineering course at the college level will be offered by the Nebraska chapter and the Omaha Board of Education come fall.

The course, starting around Sept. 20, will encompass 20 hours of theory, 60 hours of mechanical engineering and 100 hours of shop products. Meeting two nights a week from 7-10 p.m., the classes will run for 30 weeks. The course will be taught at the Omaha Technical High School, 33rd at Cummings Sts., Omaha.

Total fee will be \$6, and only 40 will be able to register for the course. R. A. Dull, chairman of Nebraska chapter's education committee, 2560 Newport Ave., Omaha, is in charge of registration.

Instruction will be in design and construction of jigs, fixtures, punches, dies, gears, special tools and machinery—as well as shop mathematics, elementary metallurgy, mechanical drawing, machine work, hardening and tempering and heat treating.

Long Island Holds Panel Discussion

"Can Tool Engineers Plan and Prepare Themselves for Future Roles in Management" was the subject discussed by a panel for members of the Long Island chapter on May 23.

Moderator was Jerome Barfus, supervisor of Plant 5, Manufacturing Engineering Division, Grumman Aircraft Engineering Corp. Panelists included: Adolph Kastelowitz, chief manufacturing engineer, Republic Aviation Corp.; Sidney Weinrib, secretary-treasurer, Sterling Optical Co., Inc.; Otto Leutz, director of planning, Fairchild Camera and Instrument Corp.; Edward Nezbeda, chief tool engineer, Grumman Aircraft Engineering Corp.; and Walter Jellig, chief tool engineer, Ford Instrument Co. —William H. Bruning

Panel Discussion Held at San Fernando Valley

The Los Angeles chapter of the American Die Casting Association presented a panel discussion for the members of the San Fernando Valley ASTE chapter on July 6 at Hody's Restaurant in North Hollywood. Panelists were Curt Levinson, Art Townhill and Ray M. Felix. Mr. Felix acted as moderator. "How Else Can You Do It," a film on die casting, was shown preceding the panel discussion. Sixty-five attended this meeting. —Sam Schwartz



ROCHESTER—John Dense, left, former national director of ASTE, receives the past director's award pin from Chapter Chairman William Kamolola. Mr. Dense is also past chairman of Rochester chapter.

Chairman L. C. Seager Announces \$500 Donation

Leslie C. Seager, chairman of the National Professional Engineering Committee, announces that the Society has donated \$500 to the National Council of State Boards of Engineering Examiners as evidence of its continuing interest in professional registration.

The Council, made up of members of examining boards of all states, meets once a year to exchange ideas and information on engineering registration. Individuals on the Council, who are usually appointed by state governors, give freely of their time as examiners in preparing, grading and administering tests.

"Controlled Air Power" Discussed by Speaker

Speaker at Northwestern Pennsylvania chapter's last meeting of the season was Frank Moore, field engineer for The Bellows Co. On June 30 he addressed about 50 members at St. Mary's High School auditorium on the subject "Controlled Air Power." Lester Boese, district sales manager, assisted Mr. Moore. —F. H. Grimone

Golden Gate Stages Ladies' Night Program

Saturday, June 18 was set aside by Golden Gate members for their annual ladies' night festivities. The event was held at Orinda Country Club. Nearly 80 couples were on hand for the program of dinner, dancing and entertainment. Arrangements were handled by Second Vice Chairman Jack Giezen-danner and his entertainment committee. —John E. Wilson

Welding Discussion Given at Santa Clara

With many of the officers of the Santa Clara branch of the American Welding Society in attendance, the June 21 ASTE meeting featured a discussion on "Welding—Its Application to Rockets."

Speaking to the group of 85 persons was Frances H. Stevenson, production engineer at Aerojet-General Corp., a subsidiary of General Tire and Rubber Co. Mr. Stevenson emphasized the importance of the joint understanding of each other's problems on the part of the welding and the tool engineer.


—William H. Forbes

R. B. Russell Discusses Automatic Weld Tooling

San Gabriel members attending the chapter's June technical session heard a discussion on "Automatic Weld Tooling for Aircraft and Missile Parts." Presenting the program was R. B. Russell, owner and manager of Airline Welding and Engineering Co., Hawthorne, Calif.

His talk covered automatic tools, streamlining, fusion butt welding and techniques. The Airline machines are designed to blend into conveyor lines with automatic chucking, rotation of parts, and automatic ejection of the part and transfer.

Other meeting notes include the awarding of prizes to Walter Mason, Larry Westerman, E. B. Jones and W. L. Stone. —Everett S. Nance



Don't forget to send us a letter, card or change of address form as soon as your plans to move are definite. Include both your old and your new address. Notify: The American Society of Tool Engineers, 10700 Puritan Ave., Detroit 38, Mich.



The conference room at national headquarters, setting for many national level meetings, was taken over July 9 by the National Public Relations Committee. Seated clockwise, from left, are: Harry J. Todd; David A. Schrom, vice chairman; Vice President Howard C. McMillen; Executive Secretary Harry E. Conrad; Wilfred B. Wells, chairman; Richard J. Bacik, staff administrator to Education and Program Committees; H. Richard Gebers, public relations manager and staff administrator to the Public Relations Committee; and John A. Sheridan. Standing are: Glen H. Stimson; William Schleicher; Clifford P. Farr; and George C. Bennett.

Position Wanted

SALES ENGINEER OR MANUFACTURERS' REPRESENTATIVE—to assume responsibilities of manufacturers' representative as application engineer, sales and service. Many years' experience in design, manufacture, application of machine tools and product equipment. Wide acquaintance with aircraft and other manufacturing plants in Los Angeles and Southern California. Have no other lines at present. For details write to Box 051, News Department, The Tool Engineer, 10700 Puritan Ave., Detroit 38, Mich.

Positions Available

SALES REPRESENTATIVES—wanted to handle finest line of German built machine tools—such as Lindner Jig Bore, Bokoe Special Millers and other reputable tools (all backed by Orban Service and spare parts). Will consider supplementing your present lines. Many open territories. Call or write, furnishing full particulars to Kurt Orban Co., Inc., 34 Exchange Place, Jersey City 2, N. J.

Nebraska Hears President Osborn

Special guest at Nebraska chapter's June 23 meeting was ASTE's national president, H. B. Osborn, Jr., who is technical director of the Tocco Div. of The Ohio Crankshaft Co. in Cleveland.

Dr. Osborn gave a talk on national activities of ASTE and also delivered a technical discussion entitled "Tooling for Induction Heating." Close to 50 members and guests attended the session held at the Lincoln Hotel in Lincoln, Neb. —Dean W. Roper

Evansville Visits Princeton, Ind., Firm

A trip to Princeton, Ind., to visit the Potter & Brumfield Mfg. Co. was on the agenda for Evansville chapter. About 80 members toured the company which is the largest electronic relay manufacturer in the world. The visitation was arranged by Marvin Babcock and directed by Mr. Newton, personnel director. —William H. Brooks

Twin Cities Chapter Plans Dinner Dance

Planning for the annual dinner dance on Sept. 17, a committee of Twin Cities chapter met at Minneapolis Honeywell on July 7. The Radisson Hotel will be the site of the gala event.

—R. Roy Wressell

Fox River Valley Offers Fall Course

The Fox River Valley chapter announces that it will sponsor a course in basic metallurgy as applied to every day tool room practice and to ordinary manufacturing processes. The class, starting Monday evenings in mid-September, will be held at St. Charles Vets Club.

Instructor for the course will be M. H. Townsend who is chief metallurgist at Burgess-Norton Mfg. Co., Geneva, Ill.

There will be a nominal charge to cover the cost of textbooks and operating expenses for the course. It is open to anyone interested in the subject.

—Harold L. Smith

Pittsburgh Sponsors Fall Education Series

The education committee of Pittsburgh chapter announces its first annual educational series to be held at Carnegie Institute of Technology this fall. Five sessions will be held on four consecutive Monday nights, winding up with the fifth session to be combined with the chapter's regular technical and dinner meeting when certificates will be awarded all who attended the sessions. Registration for the series is \$2 for members and \$5 for nonmembers.

The first scheduled session, on Oct. 10, will be an introduction to carbides by representatives of Carmet Div., Allegheny Ludlum Steel Corp.

On Oct. 17, Newcomer Products Co. representatives will present a program on toolmaking. The following week's session, on Oct. 24, will be on application and grade selection and will be handled by Kennametal, Inc.

Carboloy Div. of General Electric Co. will be responsible for the Oct. 31 session on specific applications. The final session, on Nov. 4, will be devoted to a general discussion of carbides in machining and forming operations. Presentation will be by representatives of Firth Sterling, Inc. —E. L. Caughey



DETROIT—Speaker at Detroit's May 12 meeting was Dr. Robert F. Pearse, executive vice president of Worthington Associates, Inc. From left are: Robert Reinhardt, program chairman; Dr. Pearse; and Carl Abbott, chapter chairman.

Oil Field Operation Topic at Long Beach

"How an Oil Field Works" was discussed by Robert J. Misbiek at Long Beach chapter's July 13 meeting. Mr. Misbiek, petroleum engineer for Richfield Oil Co., told how to obtain more than 60 percent of the oil in the existing sand strata by pumping gas and salt water back into the ground.

Orville A. Porter, coffee speaker, presented a method of remembering names and faces. Seventy attended this meeting. —J. B. Irby

coming ASTE meetings

National

SEMIANNUAL MEETING—of the National ASTE Board of Directors, Oct. 28-29, Statler Hotel, Detroit.

NATIONAL OFFICERS—Oct. 7-8, National Headquarters, Detroit.

NATIONAL EDUCATION COMMITTEE—Sept. 16-17, Conrad Hilton Hotel, Chicago.

NATIONAL FINANCE COMMITTEE—Sept. 16, National Headquarters, Detroit.

NATIONAL PROFESSIONAL ENGINEERING COMMITTEE—Sept. 16-17, Conrad Hilton Hotel, Chicago.

NATIONAL PUBLIC RELATIONS COMMITTEE—Sept. 18, Chicago.

NATIONAL STANDARDS COMMITTEE—Sept. 30 Statler Hotel, Detroit. Carbide Subcommittee, Sept. 26-27, National Headquarters, Detroit. Tool Steel Subcommittee, Sept. 21, National Headquarters, Detroit.

Chapter

FOND DU LAC—Sept. 23, 6:30 p.m., Green Bay. Contact William H. Jorgensen of Green Bay for reservations.

GOLDEN GATE—Sept. 21, 6:30 p.m., Spenger's. "Unusual Patents" by Charles O. Bruce, patent attorney, American Trust Bldg., Berkeley, Calif.

HENDRICK HUDSON—Sept. 21, 6:30 p.m., Circle Inn, Lathams, N. Y. Second annual ladies' night.

HOUSTON—Sept. 13, 6 p.m., Wyatt Metal and Boiler Works, Houston. Plant tour.

LONG BEACH—Sept. 14. "Control and Application of Nuclear Energy" by Robert L. Olson, Nuclear Engineering Dept., North American Aviation, Inc.

LONG ISLAND—Sept. 12, 8:30 p.m., Garden City Hotel, Garden City, L. I., N. Y. "Economical Production—Fit Concept for Precision Equipment" by Jack Wagner, product engineer, Arma Div., American Bosch Arma Corp.

LOS ANGELES—Sept. 16, Rancho Golf Club. Annual golf tournament and dinner.

LOUIS JOLIET—Sept. 20, 6:30 p.m., Woodruff Hotel. "Technical Consultant's Place in Metal Stamping Industry" by Stanley Cope, president, Acme School of Die Design Engineering Co.

MONADNOCK—Sept. 22, 7:15 p.m., Kingsburys Machine Tool Corp. Cafeteria. "Jig Design and Operational Technique" by Frank Zagar, president, Zagar Tool Inc.

NORTHERN MASSACHUSETTS—Sept. 20, 7 p.m., Weldon Hotel, Greenfield, Mass. "Abrasives—Their Development, Use and Importance" by Gordon T. Rideout, abrasive engineer, Norton Co.

PORTLAND, ME.—Sept. 9. "Fundamentals of Silver Brazing" and Production Brazing with Low Temperature Alloys" by A. M. Setapan, manager of engineering, and William Weber, sales engineer, both of Handy and Harmon.

ROCHESTER—Sept. 17, 2:30 p.m., Sweets Farm, Annual clambake.

SAN FERNANDO VALLEY—Sept. 7, 7 p.m., Hody's North Hollywood. "Cerro Alloys" by O. J. Seeds, manager of alloy sales, Cerro De Pasco Corp.

SPRINGFIELD, MASS.—Sept. 10, Whipperon Country Club. Annual outing.

ASTE Industrial Exposition and 24th Annual Meeting will be held March 19 through 23, 1956 at Chicago, Ill. The Exposition will be held at the International Amphitheatre.

TOLEDO—Sept. 14, Maumee River Yacht Club. "Possibilities and Limitations of Cold Roll Forming" by Elmer J. Vanderploeg, chief engineer, Yoder Co.

TWIN CITIES—Sept. 17, 6:30 p.m., Radisson Hotel. Annual dinner dance.

WORCESTER—Sept. 19, 7 p.m., Hickory House. Joint meeting with Society of Carbide Engineers. "Vibration and chatter" by Dr. R. S. Hahn of The Heald Machinery Co.



Milwaukee Journal Photo

MILWAUKEE—Past Chairman Robert Bodendoerfer, right, presents two scholarships of \$400 each to Robert Kutschera, left, and Kenneth Voight, center, students at Boy's Trade and Technical High School of Engineering. Milwaukee chapter's education program has included scholarships for many years and a sizable sum of money has been set aside to continue the awards.—Walter Behrend

Chautauqua-Warren Distributes Publications

The education committee of Chautauqua-Warren chapter, consisting of Ray Samuelson, chairman, Samuel Chestnut, William Houston and Dick Freeman, is placing copies of the *Tool Engineers Handbook* in the libraries of Sheffield, Youngsville and Southwestern High Schools. They will also award one copy to the outstanding June graduate in the technical department of the Jamestown High School.

Another activity which the committee will continue is giving subscriptions of THE TOOL ENGINEER to the Jamestown and Warren High Schools and the Jamestown Community College. The committee has also been instrumental in having the Jamestown Community College offer a "cram course" for those taking the exam for a professional engineering license. —Walter N. Carlson

John A. Baskis Gives Springfield Program

A talk on "Thread a Form Rolling" was given June 13 before members of the Springfield, Mass., chapter. Speaker was John A. Baskis, assistant sales manager of Reed Rolled Thread Die Co.

Illustrated with slides, his discussion covered general principles of circular and reciprocating methods. A display of products having rolled features, and the tools which produced them, was on exhibit.

A movie on "Hydraulic Press Brakes" produced for Pacific Industrial Mfg. Co. showed many unique applications. —Allen M. Johnson

23rd ASTE ANNUAL MEETING

TECHNICAL PAPERS AVAILABLE NOW!

The following papers delivered at the 23rd Annual Meeting of the American Society of Tool Engineers, in Los Angeles, March 1955, can now be ordered.

<i>Paper No.</i>	<i>Title</i>	<i>Paper No.</i>	<i>Title</i>
T1	Magnesium—A Light-Weight Machinable Metal for Low-Cost Tooling	T11	Mercury-Pattern Precision-Cast Design and Tooling
T2	Uniterm Coding—A New Tool for Controlling Information	T12	Ceramic Parts and Tooling for Mechanical Applications
T3	Coding and Administration of Engineering Drawings	T13	20 mm. Shell Tooling and Production
T4	Findings and Directions in Chip Breaker Design	T14	Tooling for Cold Steel Extrusion
T5	Some Recent Research on Twist Drills and Drilling	T15	The Heat Treatment of Steel
T6	Advantages in Leasing Production Equipment	T16	Aluminum Heat Treatment
T7	Setting Goals in Automation		
T8	Planning for Effective Gear Inspection		
T9	Rolled Flow Forming of Toothed Parts		
T10	Bases for Selecting Standard vs. Special Machine Tools		

CONFERENCES

C1	Plastic Tooling For Production
C3	Preparing Engineers for Manufacturing Responsibilities
C4	Coordination of Manufacturing Management
C5	Quality Control Through Realistic Tolerances

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The NEW V-R TOOLHOLDER with 6° positive rake



**Works Like Positive Rake Brazed Tool
... Saves Money with "Throw-Away"
Inserts, Cast Alloy Chipbreaker Plate**



**AR brazed
tool**

**New V-R 6° Positive Rake
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Both will do exactly the same operations!

SAVES MONEY 8 BIG WAYS

- Free cutting action of 6° positive rake ends excessive heat . . . eliminates distortion of piece parts.
- Allows use of harder grades of carbide than are normally used in brazed tools.
- Elimination of excessive heat with positive rake toolholders allows machining to closer tolerances.
- Patented V-R "elevator" locks "Throw-Away" insert solidly in toolholder at 6° positive rake angle . . . firm as a brazed tool.
- Cutting edge automatically positions on center . . . saves setup time.
- In case of tool "wreck", elevator is quickly and easily repaired or replaced.
- Insert indexed to new cutting position in seconds.
- Eliminates all carbide grinding.

Now V-R combines the operating efficiency of a positive rake brazed tool into a 6° positive rake toolholder with the proven economy of "Throw-Away" blanks and a cast alloy chipbreaker.

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Aluminum, soft brass, copper, bronze, stainless steel and all other types of materials, including alloyed steels can now be machined more easily and economically than ever before.

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See new V-R positive rake toolholder.

Production Engineering Show Chicago, September 6-16, Booths 246-247.



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PROGRESS

IN PRODUCTION

AUTOMATIC WELDING EQUIPMENT

USES CARBON DIOXIDE SHIELDING GAS

A practical method of using gas-shielded welding for mild steel applications has been found with development of automatic consumable-electrode welding equipment especially adapted for use with low-cost carbon dioxide by General Electric Co.'s Welding Dept.

By adapting the G-E equipment to the peculiar characteristics of carbon dioxide, the advantages of the gas-shielded techniques can now be extended to mild steel fabricating. Even though superior results with argon or helium gases have been demonstrated with equipment on various ferrous and nonferrous metals and alloys, gas-shielded welding of steel was generally uneconomical because of the high cost of those gases. Therefore, applications were confined to instances where the submerged-arc process could not be utilized because of problems with flux.

Now, two advances have led to development of a practical method of using CO₂. One was an understanding of the need for a shorter arc and higher wire-feed speed in gas-shielded welding. The second was the recent availability of dry, welding grade CO₂, which is required for the new process.

In gas-shielded welding, a consumable-wire electrode is fed to the arc and no flux is used; thus the operator can see the arc clearly and inexpensive fixtures can be used.

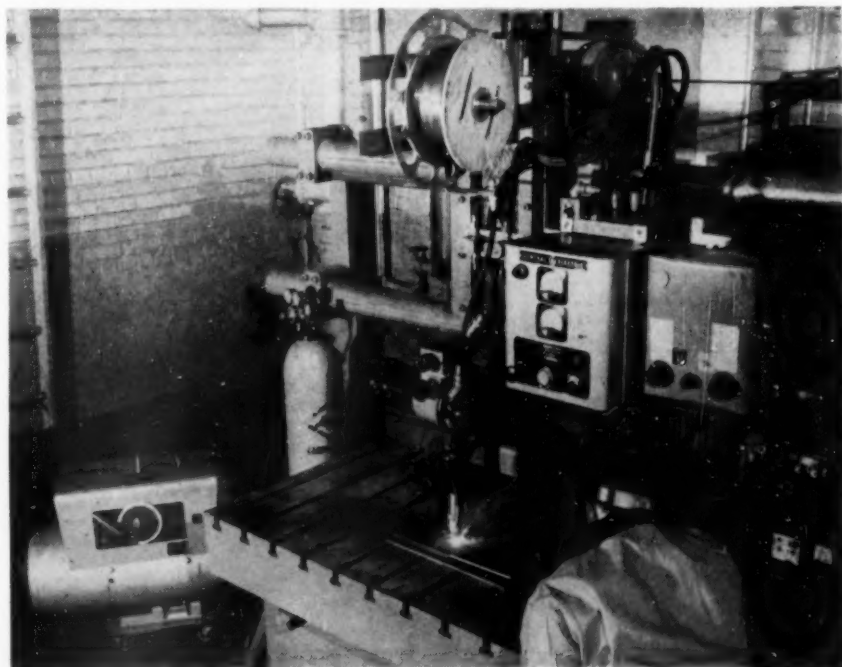
The visible-arc feature permits substantial savings because of the simple

fixtures used, while up to 70 percent faster operation is possible on certain applications because of reduction of setup time.

Successful consumable-electrode, gas-shielded welding depends on holding an arc of constant length, which is not affected by changes in wire-feed speed. These necessary factors are accomplished automatically with the self-

regulating Fillerarc generator, which is the heart of the new G-E equipment. It has a rising volt-ampere characteristic matching the rising volt-ampere characteristic of the arc with inert gas or CO₂. The rate at which the electrode burns off always matches wire-feed speed, and the arc length remains constant. Formerly wire-fed speed had to be changed in automatic welding to equal the burn-off rate of the electrode.

Components of the new equipment include wire feeder, torch, control panel, reel mount and motor-generator



unit. Wire speeds up to 1000 ipm combined with very short arc lengths are used to produce a deeply penetrating arc with a minimum of spatter. Violent agitation is set up in the weld puddle with this technique, permitting more porosity-producing gas to escape. Thus, higher quality welds are produced.

The operator may select desired arc length by a single generator dial. Wire-feed speed is set at the control panel. Current and voltage adjust automatically.

With the equipment Fillarc welding may be accomplished in any position including vertical or overhead. The entire welding operation is controlled with two pushbuttons at the compact, combined operator station-control panel. It is adaptable to light or heavy gage materials. A further feature of the unit permits easy tack welding.

ECONOMICAL ALUMINUM TUBE FROM STRIP

A low-cost method developed that enabled fabricators to make their own aluminum tube directly from strip has been reported by Reynolds Metals Co. in its publication, *Technical Advisor*. The resultant economy permits the field of application for aluminum tubing to be extended considerably.

In the new method, which easily handles diameters from $\frac{1}{2}$ to $2\frac{1}{4}$ in. and wall thicknesses from 0.020 to 0.083 in., strip is formed into a tube by a series of forming rolls. From the rolls, it passes through a welding head where electric current at 450,000 cycles is focused to heat the edge of the strip only at the precise spot where the edges are butted together. Other rolls take over and the melted metal is pressed out so that only a fine welding

zone remains. Consequently the weld zone is equally as strong as the unwelded tube. The amount of heating is so closely controlled that the weld can be touched with the bare hand less than a second after it is made. Rate of welding is 100 fpm and faster.

The process, developed by The Yoder Co., is considered suitable for working the nonheat-treatable aluminum alloys. Thus it is possible to produce tube from those alloys which have heretofore been unavailable as temper drawn tube. This is significant because the alloys without heat treatment have as much or more yield strength as those which must be heat treated to gain required strengths.

The technique takes advantage of the lower cost of the tube itself plus several associated saving factors. Because the "fusion-formed" tube is made from precision-rolled strip, the wall thickness is identical all the way around the tube, and lighter-walled tube may be used because of this assurance of uniform strength. This has a further advantage because of the savings in weight.

Production and inspecting material in strip form results in a smaller grain size and also a brighter finish, and these metallurgical and physical advantages are passed on to the resultant tube. In addition, the alloys 5050 and 5052 used make tube that is less susceptible to intergranular and pitting corrosion. Besides, these alloys have not been subject to heat which decreases their strength and corrosion resistance.

Still other advantages are that the exact dimensions obtainable in tube made by the Yoder process permit fabricators to reduce clearances on tube-forming tools and avoid gouging, scuffing, etc. Finally, there are resultant savings from being able to standardize on tools, and also to avoid extra operations ordinarily required to make matching pieces of tube match.



Holes, Contours, Surfaces

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Co., Inc., 732 Union Ave., Bridgeport 7, Conn., builders of Jig Bore, Jig Grinders, Panto-Crush Wheel Dressers, Precision Rotary Tables, Motorized Centers and a complete line of Hole Location Accessories.

7 Tricks of the Trade in Jig Grinding Small Holes

The following tricks of the trade will prove helpful in jig grinding small holes with a diamond-charged mandrel:

1. Uniformly graded diamond powder should be used for charging mandrels. Holes from minimum ($1/64"$) to about $3/32"$ in diameter should be roughed and finished with 50-100 grit powder. Larger holes may be roughed somewhat more rapidly with a coarser grade, 60-80 grit.
2. Avoid bellmouth by preventing the mandrel from leaving the hole at either end.
3. Since a freshly charged mandrel will cut much more rapidly than a worn one, avoid introducing a freshly charged tool as a hole nears size, Fig. 1.
4. Do not permit the uncharged shank of a mandrel to contact the surface being ground. Frictional heat will burn both the work and the mandrel. The former, partially annealed at point of such contact, will charge with diamond and probably be ruined.
5. It is generally more economical and efficient to consider mandrels as expendable and make a new one for each job. Since the cost is only a few cents, use of an old one, or even the time spent trying to match one to requirements, is hardly justified.
6. Because mandrels cannot be trued with a diamond, it is necessary to measure both the top and bottom of a hole

while grinding, in order to avoid a ridge.

7. In view of point 6, it is advisable to set the work up on parallels of sufficient height to enable measurement from beneath the workpiece, Fig. 2.

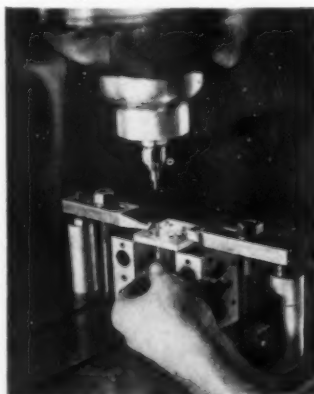


Fig. 2. Workpiece is mounted high enough to permit measuring bottom as well as top of hole.

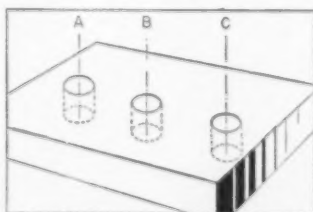


Fig. 1. In grinding three holes to size, A and B are roughed to within .001"-.002", and C within about .005". Using a freshly charged mandrel, C is finished to size, thereby breaking down the high points on the tool. A and B may now be safely ground to size.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-178

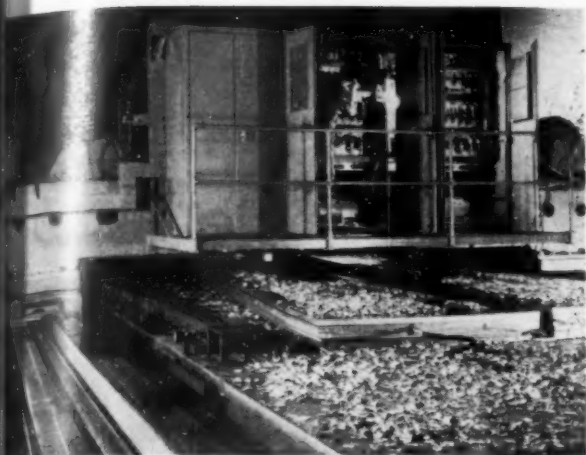
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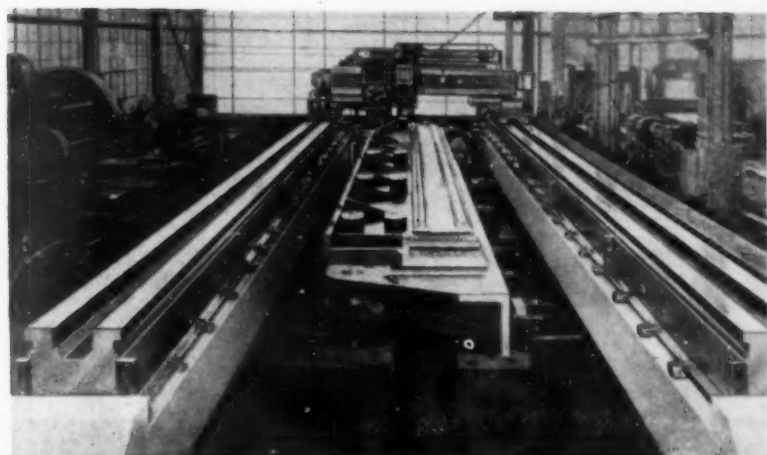


AUTOMATIC MACHINING PRODUCES ONE-PIECE WING

One-piece jet aircraft wings are being produced automatically by the giant new 450,000-lb skin mill machine made by Simmons Machine Tool Corp. for North American Aviation. The mill sculptures wing panels for the F-100 Super-Sabre Jet in only 3 hours and 15 minutes—a job formerly requiring 60 hours. Development of means of machining of the large, strong, integrally stiffened wing panels in one piece was necessitated when the tremendous jet speeds made earlier methods of wing



View from rear of mill shows cabinets enclosing 60 individual controls which make machining entirely automatic. When installed, a specially designed chute will carry away the huge volume of chips.



Overall view of the 225-ton skin mill to be used to sculpture one-piece integrally-stiffened wing sections for the F100 Super Sabre jets at North American. The entire unit measures 12 ft high, 25 ft wide and 30 ft long.

assembly by riveting obsolete.

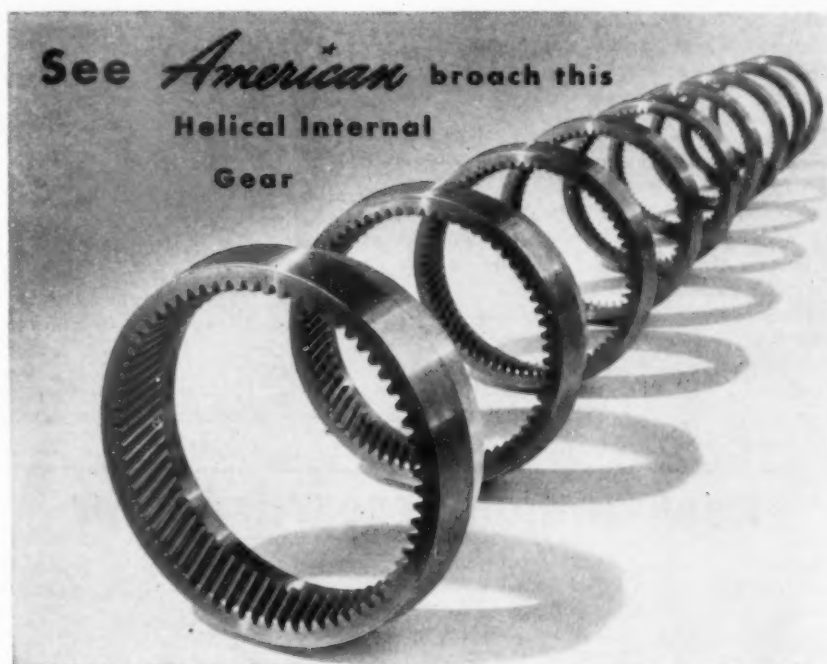
Actually, the mill resulted from a giant conversion operation. Basic portion of a 13-year old pit planer was used to build the modern electrically and hydraulically controlled machine. It now will sculpture two integrally stiffened wing panels simultaneously while also providing for addition of tooling in order to machine as many as 5 leading edge skins placed on five separate vacuum chucks. Configuration of these skins requires rise and fall and diagonal operation of two cutting heads for duplicating templates.

Longitudinal cutting speeds vary from 20 to 150 ipm in both directions. Transverse cutting feeds vary from 5 to 62 ipm. Diagonal cutting also is provided. Cutting tools are automatically located by an indexing device which also provides for visual inspection. Accuracy requirements are held as close as ± 0.001 in. Vertical rise-and-fall cutting actions control variation in thickness.

A tracer hydraulically controls the rise and fall of the cutter heads. Two consoles with banks of pushbutton stations comprising 60 individual controls are the operational centers of the machine.

A 60-hp motor powers each of the two milling heads. Spindle speeds up to 3600 rpm remove up to 250 cu in. of metal per minute. Specially designed carbide-tipped cutters vary in type and size according to the job to be done. The milling cutters, which are mounted on the spindle nose of the motor, are 2 in. wide and 14 in. in diameter.

Because of the large volume of chips generated by the skin mill, provision was made for removing them from behind the cutter. After installation at the North American plant, a specially designed chip chute heads the chips to a conveyor arrangement.



AT BOOTH 1412 — MACHINE TOOL SHOW



American broaches the I.D. and 68 internal gear teeth in this $5\frac{1}{2}$ inch diameter automotive transmission gear . . . does it fast and economically. You are cordially invited to see the machine and tooling in operation, as one of the many outstanding features of the Sundstrand and American Broach section at the show.



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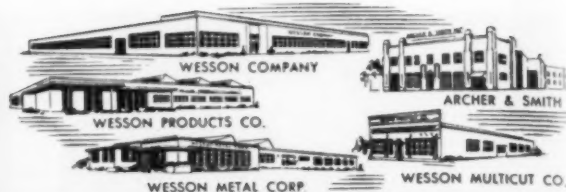
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

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carbide NEWS



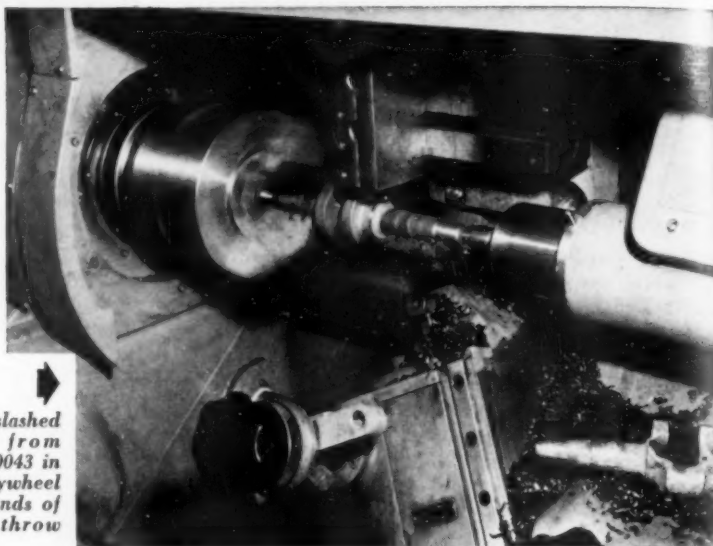
Grade 26 Cuts Tool Costs 88%

New wide range grade and holder boost pieces/grind from 85 to 800

A reduction from approximately four cents to less than 1/2 cent per piece in tool cost has been achieved in the machining of single-throw Arma Steel crankshafts by a midwestern machine company. These savings were obtained despite an increase in blade cost of 41% over the style previously used.

The savings were achieved in two steps. The first revealed that Wessonmetal Grade 26 would out-perform all other grades by an average of 50 pieces per cutting edge. The next step was to adopt a Wesson Multicut holder. This helped to increase tool life to 200 pieces per cutting edge. With four edges per insert, life is 800 pieces per grind, as against the original 85. Part of the overall increase is due of course to the rigid construction and support provided by the new holders.

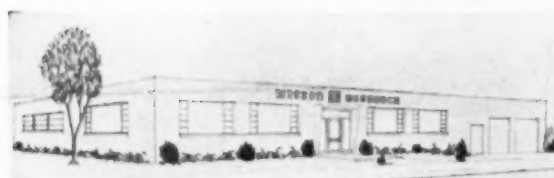
26 Carbide slashed tool cost from \$0.038 to \$0.0043 in machining flywheel and pulley ends of this single throw crankshaft.



Operations consist of rough and finish turning of the flywheel and pulley ends of the 220 Brinell steel crankshaft. Machining is being done dry on a 20 hp New Britain tracer lathe at 1210 rpm and .014" feed. Depth of cut averages 1/4 to 3/8-inch.

In achieving the savings, no changes were made in speeds, feeds or depths of cut.

New Carbide Research Center



New concepts in carbide boring and milling cutter designs may result from new research programs now under way at Wesson. Included are milling cutters utilizing "throwaway" carbide blades.

To house Wesson's expanded product development and tool application research facilities and staff, a new one-

story structure has been completed adjacent to Wesson's Detroit plant.

The new research division will supplement the basic metals research carried on in Lexington, Kentucky at

the new metals plant of the Wesson Metal Corporation, now producing all Wesson-metal carbides.

The new research division is under W. B. Bader, Vice President. It is being completely equipped for fabrication as well as testing of new tool designs. Lathes, milling machines, grinders, etc., are included in the equipment.



WESSON COMPANY
DEPT. AD

1220 Woodward Heights Blvd.
Detroit 20, Michigan

Tool Hints...

The cost-cutting story told above re-emphasizes the necessity of studying ALL the factors contributing to tool performance if maximum economies are to be obtained. In this case, the answers lay in (a) the carbide metal and (b) the tool holder. Sometimes it may be the coolant which will provide a major saving. In the chart below, for instance, are shown relative lives of the same tool material at the same speeds and feeds using five different types of coolant in the machining of Titanium 150A! A C-2 grade of carbide was used and feed was .015" at 315 ft. per minute.

With COOLANT:	C-2 CARBIDE Machining Titanium 150A	
A	315 FPM .015 FEED	
B		
C		
D		
E		
	0	40. 80. 120.
Amount of Machined Surface/Grind		

TOOLS of today

SHOW PRODUCTS SECTION

The following pages provide a preview of representative products from the many to be exhibited at the National Machine Tool Builders' Show in the Amphitheatre at Chicago September 6 through 16. Also contained in the section are descriptions of typical equipment to be exhibited at the concurrent Navy Pier Production Engineering Show and at the Chicago Coliseum Show. For additional information about any of the products described, there is a postcard insert on page 213 with which it may be obtained.

Milling Machines

Kearney & Trecker Corp. has revealed results of a concentrated development effort with announcement of several new designs. The TK series of knee type milling machines includes four sizes from No. 3 to No. 6 with 20 to 50 hp. Features of the line are dual elevating screws for knee movement and support, heavier and wider column, knee, saddle and tables; simplified

control center with front position hand control for table movement, and square wrap-around ways throughout. They have power operated draw-in rods for quick mounting of arbors from front of machine. Spindle speed and spindle reverse controls lock hydraulically while spindle is in motion.

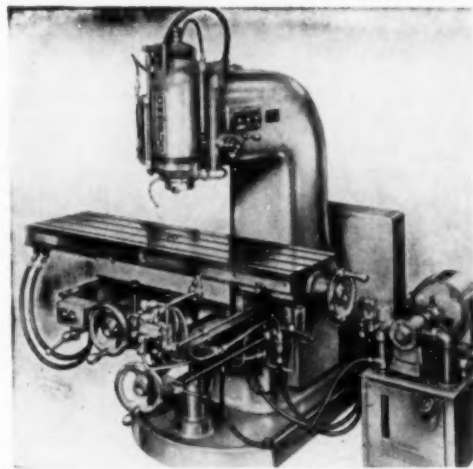
The TF series of knee type mills has 48 machines from No. 2 to No. 6 size in plain, universal and vertical styles. Similar to the TK series, this line has dovetail ways and independent motors for spindle, feed and coolant.

Combination of a horizontal spindle in the machine column and a self-contained motorized sliding ram using any one of three milling heads is the main feature of the ram head series of K & T mills which are offered in 69 variations of size and style. The milling heads available are universal, vertical or swivel vertical with quill adjustment.

The Mil-waukee-Mil series offers more than 400 combinations from among 12 table sizes and 3 variations of spindle heads. These bed type machines have 150-in feed rates, automatic electro-hydraulic program control for power feed of table, spindle heads and quills. Automatic backlash eliminator, automatic rise and fall spindle heads, and automatic quill retraction are included in design. **T-9-1811**

Workpieces as large as 30 by 48 in. and up to 5,000 lb may be drilled, bored or vertically milled on the Electromill developed by W. B. Knight Machinery Co. All controls are located in a single panel that can be moved to any convenient position. Easily maintained direct drives provide smooth operation. Variable-speed motors offer complete range of infinitely variable speeds and feeds. Throat capacity of this unit is 35 in. **T-9-1812**

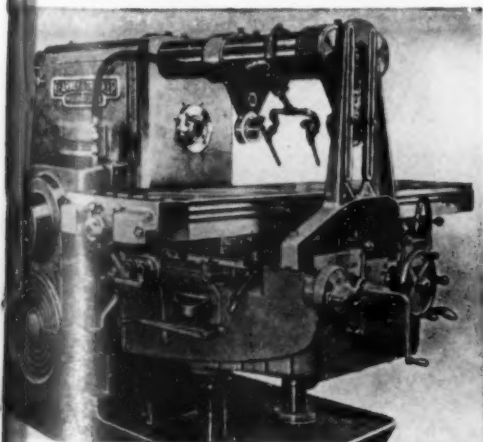
A low-priced, medium-sized hydraulic powered milling machine is introduced by Onsrud Machine Works, Inc. with announcement of its model A-245 fluid-feed unit. Advantages of-



ffered by the machine are high-speed machining of nonferrous parts, power-table feed in all directions, instant manual control without stopping the hydraulic system, and the two-speed 7.5/15 hp spindle motor providing 3600/7200 rpm. **T-9-1813**

Sundstrand Machine Tool Co. has announced several new models in its line of milling machines. A small unit of 5 hp capacity has hydraulic feed to the 10½ by 58 in. table and a maximum stroke of 24 in. Any length of combined feed and rapid traverse with the maximum stroke can be obtained. Feed range is from 1 to 100 ipm with rapid traverse of 350 ipm. A special feature of the machine and its hydraulic system is the ease with which the circuit can be arranged for hydraulic clamping.

Model C3 Rigidmil has a newly de-



signed head for heavy-duty milling. Speed ratio is 16 to 1, and the spindle speed ranges from 40 to 640 rpm. Speed changes are by pickoff gears, and 4 different speeds can be obtained with each set of two gears. Other features include consistent and positive power feed, a back lash eliminator, provision for installation of a chip conveyor and automatic control of table cycles. **T-9-1821**

Hanson-Whitney Co. has introduced a 4 by 9 in. hydraulic semiautomatic thread milling machine. Hydraulic features of this compact unit permit balancing cutter speed and work speed, plus rapid traverse to produce optimum cutting conditions for work involved. Spindle speeds are infinitely variable within normal cutting range to facilitate machining unusual alloys. Available with internal or external cutter head, the standard machine will produce internal or external, straight or tapered threads up to 4 in. in diameter, 9 in. from collet nose. **T-9-1822**

An addition to its line of die-sinking machines for the drop-forging industry has been announced by Pratt & Whitney, Div. of Niles-Bement-Pond. This model, No. 3C, is capable of handling heavy dies within the range of its 14 by 24 in. table travel. A hydraulic



duplicator is provided for tracer control operation and speeds sinking of irregular shaped die impressions. Either templates or dimensional models can be used without restricting full machine capacity.

Construction of this machine is heavy for greater strength and rigidity. Spindle power is 3 hp. Spindle speeds range from 30 to 1540 rpm in 16 steps. Ease of hand control and sensitivity,

regardless of weight of the die block being cut, is an important feature of the unit. Handwheels control servo-valves which operate hydraulic assists to move the table carriage. **T-9-1823**

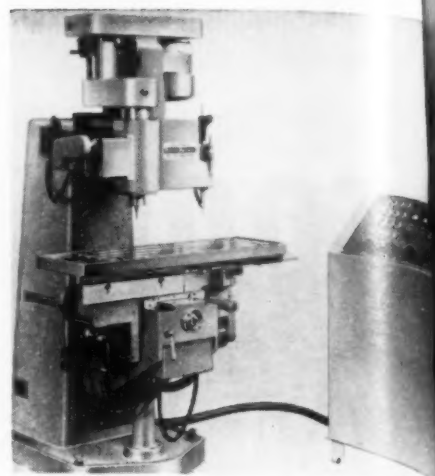
The Master-Mill, announced by Kempsmith Machine Co. as first of a line of knee type milling machines, is designed to take advantage of latest cutting tools and techniques. Rigidity, accuracy, flexibility and ease of operation are among its features. Taper spindle is powered by an individual



spindle drive motor which provides 18 speed changes ranging from 25 to 1500 rpm. Because of an electrical spindle control, there are no couplings or friction clutches. A feed-drive motor provides 18 feed changes from $\frac{3}{8}$ to 45 ipm. Both feed and speed changes are made through direct reading dials. **T-9-1824**

A new model Keller tracer-controlled milling machine, the BL 3622 model C, designed for the low-cost production of work requiring accurate duplication of complex irregular contours, is announced by Pratt & Whitney, Div. of Niles-Bement-Pond Co. This model is heavier and stronger to accommodate larger and heavier work. Spindle power is 10 hp for greater metal removing capacity. Spindle speeds from 30 to 3600 rpm in 20 steps permit most efficient cutting speeds for a variety of cutters and materials. The table, with 48 by 30 in. working surface, has 36 in. horizontal, 22 in. vertical and 12 in. transverse travel. **T-9-1825**

Pratt & Whitney has developed a new duplicator, the Velvetrace milling machine, capable of reproducing within its 12 by 9 in. work capacity, fine details of any 3-dimensional model. Tracer point of the system follows the model with complete accuracy without contacting it mechanically. Because there is no deflection or mechanical



motion in the tracer, there is no positional offset or time lag. Control signals are produced instantly and continuously. Inherent error is so small it may be disregarded. Operation of the machine is completely automatic. **T-9-1826**

To expand its mill line, Kent-Owens Machine Co. has developed the No. 3-36 hydraulic milling machine for rapid milling of large work. Speed range is 20 to 1050 rpm. Heavy bed type construction with twin post head mounting on cylindrical posts and 2 gear contacts in the spindle drive provides rigidity for top performance. The 16 by 64 in. table has a 36-in. travel with fully automatic cycle. Table traverse rate is 300 ipm, and may be fed from $\frac{1}{2}$ to 60 ipm. Separate rate controls permit independent feed travel in either direction. **T-9-1827**

The new Handymill, introduced by The G. A. Gray Co., provides a between-size unit with several advantages. It permits precision lap cuts by simple dial control; feed and traverse controls are located on a pendant; indexing for tables and heads is automatic; a simple means of avoiding backlash in the main table drive; and provides safe, quick power lifting and positioning of cutters. **T-9-1828**

Boring Machines

A precision boring machine equipped for finish boring valve-lifter bodies at gross production rate of 1200 pieces per hour has been developed by Ex-Cell-O Corp. The machine is a single-end hydraulically operated model with a new hydraulic control panel. The panel, which has been under test for more than a year prior to perfection, may be applied to hydraulically oper-



ated precision boring machines including standard and way-type models. Among the advantages it offers are faster rapid traverse for shorter machine cycle time; snubbing action for smooth deceleration from rapid traverse to feed or stop; higher feed rates for machining soft metals; single-lever manual control; dwell control by electric timer; constant feeds regardless of resistance encountered. It also is adaptable for electric control of any operating movements. **T-9-1831**

Direct dimension measuring and automatic positioning are combined features of the jig borer developed by The Fosdick Machine Tool Co. On this unit, dimensions are set from blueprints to direct-reading drum dials, one each for longitudinal and transverse measurements. Combined features of the machine assure precise location of saddle and table quickly and easily. When the drum dials have been set, simply pushing the positioning button on the control panel automatically positions the table and saddle to the dimensions desired.

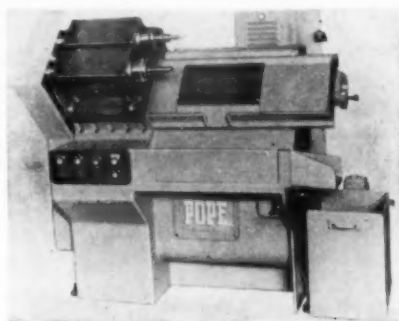
Another feature of the jig borer is an



antifriction quill mounted in two sets of ball races designed to remain permanently located at the top and bottom of the head. Because of its design, the ball-quill contact is constant at those points whether the quill is raised or lowered. Thus friction between quill and head casting is minimized and the spindle has maximum support.

Sixteen spindle speeds from 30 to 1800 rpm are offered while 8 feeds range from 0.0005 to 0.010 ipr of spindle. Speed and feed of the next operation may be preselected while the machine is running. **T-9-1832**

A multi-spindle, single-end boring machine of 9-in. table stroke is being introduced by Pope Machinery Corp. This model R-2 precision machine combines electrical control and mechanical rotating operation, and offers both simplicity and versatility. There are no cams, change gears, sprockets or linkages. It has infinitely variable feed and traverse rates. The automatic op-



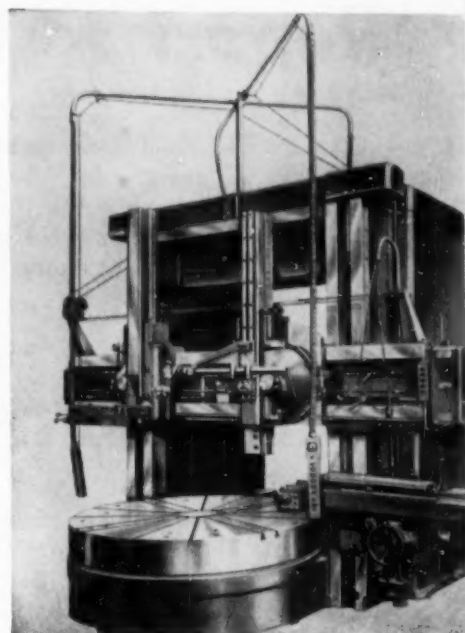
erating cycle includes a timed loading period when desirable. Long life and simplified maintenance are gained because the table actuating mechanism consists entirely of rotating elements.

The table and bridge are set at a 45-degree angle to permit rapid loading and unloading, and free flow of coolant and chips.

Electrical controls are incorporated in a separate cabinet for quick accessibility and economy of floor space. **T-9-1833**

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

An 8-ft Hypro heavy-duty vertical boring and turning mill featuring special box construction housing and extra-heavy bed and table unit is announced by Giddings & Lewis Machine Tool Co. Two precision antifriction table tracks support work loads up to 55 tons. Table or work misalignment because of radial thrust is prevented



because of a large tapered roller bearing at the center of the table.

Speed range of the machine is from 0.7 to 60 rpm. An electronically controlled duplicator provides 2-dimensional tracing. Other features of the unit are constant surface speed attachment and a constant chip thickness control; a right-and-left hand ram type swiveling rail head, and a right hand side head with independent motor traverse. **T-9-1834**

Increased operating accuracy and larger capacity mark the new Autometric line of vertical precision boring machines now available in No. 3 and No. 4 sizes from Kearney & Trecker Corp. Feature of these machines is a system of precision measuring by use of dual screws for both saddle and table. In each case, one screw is used for drive while the second is solely for measuring. The system provides unusual accuracy of finished work, and also simplifies and speeds workpiece positioning.

Another feature of the Autometrics is the adjustable sliding head which is counterbalanced and has 10 in. of vertical travel with 11 in. of quill adjustment for increased range. **T-9-1835**

To meet a demand for a smaller machine for jigless boring of production parts and machining of jigs, fixtures and experimental parts, DeVlieg Machine Co. has designed the Model 2B-56 Spiramatic Jigmil. This tool has a 2½-in. diameter spindle bar with #40 NMTB taper, 12-in. bar feed, 24 by 36-in. table, 36-in. horizontal travel and

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Which is very much like industry itself. Basically industry has not changed since free enterprise was conceived on this continent. But in every detail it changes from year to year.

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There was no single big thing wrong with the cylinders being manufactured yesterday. Just a lot of little things. So Miller Fluid Power made the improvement of little things its business.

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On occasion we like to have others listen to us. Especially when what we have to say will help our customers. That is the idea behind our College of Cylinder Knowledge. We know a lot about cylinders. Though not as much today as we will tomorrow or the day after.

In our College of Cylinder Knowledge we try to show you what good cylinders can do for you. And what you should demand in any cylinder you buy. We meet other men who know what they want in a cylinder. We listen to their wants and try to explain what perfection in detail means.

We believe that when the users of cylinders sit down across the table from the producer who is trying to make the best, better cylinders result.

We'll be carrying that belief into the Production Engineering Show at Navy Pier in Chicago on September 6. Our College of Cylinder Knowledge booth will be open for that kind of discussion. We'll listen and learn.

The only way we can learn is from you. We can help you. But not until you've dropped that problem of yours in our lap. Your problem contains the stuff of which the better cylinder will be made. The cylinder that will have that quality plus which we like to think is the stamp of Miller Fluid Power.

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Special feature of the equipment is an unusual index table for jigless boring of repetitive parts where it is necessary to bore workpieces accurately from two or more sides. It also has automatic positioning to horizontal and vertical slides and a power operated tool lock mechanism. **T-9-1851**

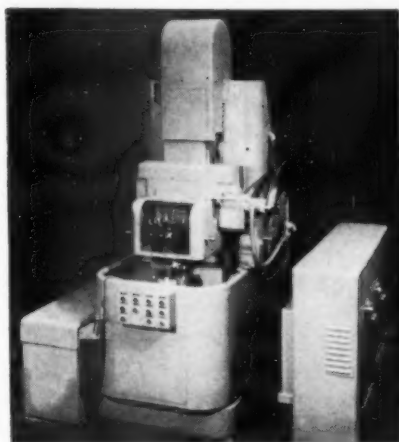
A new No. 300-RT horizontal boring, drilling and milling machine featuring a 30 by 36 in. built-in revolving table for fast, accurate indexing of difficult work setups is announced by Giddings & Lewis Machine Co. Among its advanced design features are independent operation of headstock, table and saddle in either direction, individual directionally operated controls, spindle speed range of 7 to 1600 rpm, and an electric pushbutton pendant for convenient control of machine functions. **T-9-1852**

Two new horizontal and one redesigned vertical spindle cam actuated Bore-Matics have been announced by The Heald Machine Co. The horizontal machines, identical except for size and capacity, are constructed with rigid bases and hardened steel box type ways which are under continuous pressure lubrication. A hydraulic gib maintains accurate alignment as well as functioning automatically to take up any slight wear which occurs. Primarily the units are intended for continuous high production of a single part; however their design offers unusual setup simplicity.

Cycle speeds are easily changed within wide limits. Rapid traverse stroke is 10 in. on the model 2215 and 13 in. on the larger model 3215. Boring stroke is 4 in.; cross slide stroke, 3 in. Any combination of straight, taper or contour boring, turning, facing or grooving operations can be performed.

The vertical spindle machines have up to four stations for facing, chamfering and grooving, and boring and turning may be included where desirable. The cam unit actuates a horizontal slide through a mechanical linkage providing a 3 to 1 ratio. Box type slides are similar to the horizontal machines.

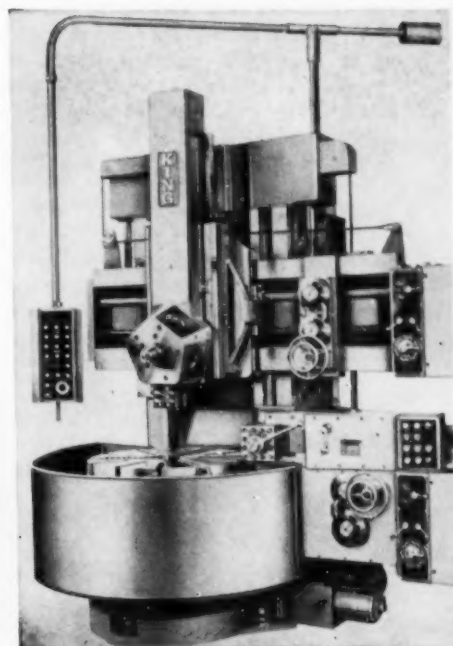
Another new machine, the Model S vertical Bore-Matic, has been developed by Heald to accommodate work which is more easily loaded and machined in the horizontal plane. Vertical or an-



gular as well as horizontal slide unit mountings are made possible on this unit. One or more slides may be mounted vertically on the vertical base. This machine not only permits faster and easier loading and clamping for many types of work, but takes a minimum of floor space as compared to its horizontal counterpart. **T-9-1853**

The G. A. Gray Co. is manufacturing a new horizontal boring, drilling and milling machine which may be set quickly to 0.00025 in. accurately by pushbutton. Optical measurement is by ground glass screens provided with zero adjustment verniers. Spindle speed range is from 4.5 to 900 rpm. Bar travel is 60 in.; vertical head travel is 72 in.; column travel on the runway is 96 in.; and column cross travel is 24 in. **T-9-1854**

Two new vertical boring and turning machines are being introduced by King Machine Tool Div. of American Steel Foundries. One is a single-column 36-in. size and the other a double-column 56-in. size. Higher horsepower ratings of 40 to 50 have been included on 30 to 46-in. sizes and 75 to 100 hp on sizes of 56-in. and up. The units have 24 feeds and 24 speeds arranged in geometric progression in any of three



standard ranges. There is preselective speed setting from a direct reading dial.

Redesigned and improved mounting of the spindle and all heads and turrets plus other construction features have increased the machine rigidity with resultant increase in cutting accuracy. Components have been redesigned to reduce wear and consequently simplify maintenance, while wide use of unit construction has provided maximum accessibility for necessary maintenance. **T-9-1856**

The new jig developed by Cleereman Machine Tool Co. shows a departure from conventional design both in structure and operation. Work positioning is completely automatic and involves no manual handling of table or saddle slide operation. Heavy work is completely



supported through the range of the unit. Guide insures precise table and saddle alignment. Operation has been speeded by new tooling of the spindle nose, while operating efficiency has been increased because of a special control arrangement. **T-9-1861**

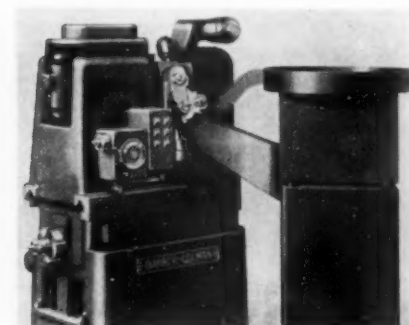
Bryant Chucking Grinder Co. has developed a model 998 precision boring machines which may be tooled to turn, bore, chamfer and face clutch collars



at the rate of 80 pieces per hour at 100 percent efficiency. A cross slide allows generating the gear faces with single point tools and a dial-type boring bar provides accurate boring to close tolerances. Clutch collars produced by the unit have a finish of 63 microinches, rms. **T-9-1862**

Gear Cutting Equipment

Automatic loading and automatic gaging of mass-produced parts are features of Barber-Colman Co.'s No. 3-6 vertical hobbing machine. Basic elements of the machine are standard while tooling, loading, gaging and handling are designed to suit requirements of each part. Designed for continuous operation rather than general-purpose work, it has wide application for high-speed production of various gears up



to 3-in. diameter by 6-in. face width. Pitch capacity is 10 DP. Tooling can be changed on this single-purpose machine in order to cut another part. Design features include short and compact drives to both work and hob spindles, a multiple-thread index worm for maximum work speed, hobs designed with a minimum diameter to increase indexing speed for a given surface speed. **T-9-1863**

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New series of large disk-type gear-cutting machines for spur gears and sprockets made by Gould & Eberhardt, Inc. includes the 72S gear-cutting unit for rapid, economical production. Its unusually heavy, rigid construction plus special features provide extra accuracy. Operation is on the vertical cutting principle; stanchion is adjustable for various diameter gears and depths of cut. Automatic cutting cycle comprises feed of cutter, rapid return of cutter and indexing of work for each tooth.

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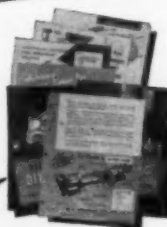
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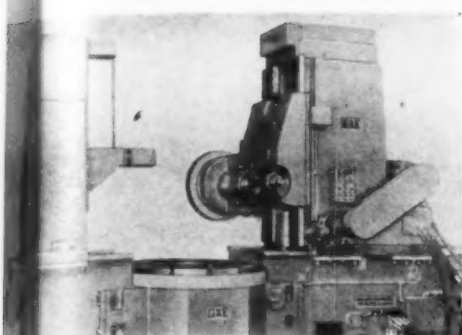


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The indexing mechanism is hydraulically operated for slow start, acceleration, and deceleration upon completion of each indexing cycle. The unit is rated for 1 DP in steel. It accommodates gears up to 90-in. diameters with support retracted, and 50-in. gears with support in place. Face capacity is 30 in. Index range is from 12 to 400 teeth.

High-speed universal gear hobbing machines for spur gears, single and double-helical gears, spline shafts and sprockets also are announced by Gould & Eberhardt. These 24H and 48H models offer hob speeds ranging from 90 to 550 rpm and 65 to 400 rpm, respectively, to permit economical operation with regular high-speed steel hobs at surface speeds of 300 fpm or more. Featured on these units is an automatic cutting cycle, called Quadricycle, which comprises fast enter in-feed followed by hobbing feed so arranged that the machines can be used either for climb or conventional cutting. **T-9-1871**

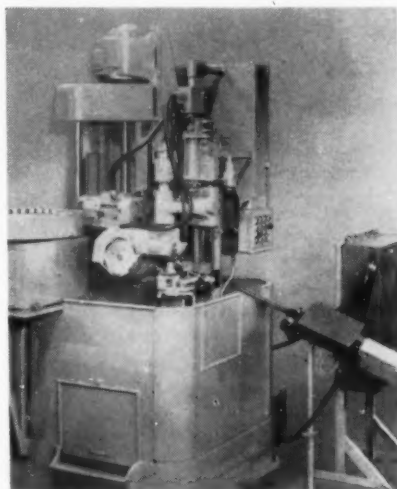
Several new machines for gear broaching are being introduced by National Broach & Machine Co. Among the new equipment are two Red Ring



models GCU 12-in. external gear shavers, with an automatic differential up-feed mechanism. One, with an automatic loader, is adapted to shaving an automotive transmission cluster helical gear while the other, equipped with a special long table, is set up for shaving an automotive transmission helical clutch gear. **T-9-1872**

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A compactly designed helical gear hobbing machine for high-speed mass production is announced by Gould & Eberhardt, Inc. Main feature of this unit, the 10HQ HoBlique, is the feeding of the hob tangent to the helix of the gear being cut with either of two basic cutting cycles. One arrangement is the Tri-Lineal cycle which provides three feed rates in series, two succes-



sive fast enter feeds at different rates followed by a hobbing feed. The other method is the Quadricycle with a fast enter infeed followed by a hobbing feed tangent to the helix.

With the hydraulically operated hob feeding in the direction of the helix angle, there is no need for a lead-screw, a differential or lead cam, or for lead and feed change-gears. Hob wear is distributed over the entire hob length. The oblique feed results in shorter hob travel resulting in optimum production.

The fully automatic cycle is actuated by a single pushbutton. **T-9-1873**

A gear-hobbing machine with Auto-Motion is announced by Lees-Bradner Co. A single spindle model of the Model 7 Type HD heavy-duty high-production gear hobber, the unit is equipped for self-loading and unloading, plus a

checker and feed back for adjusting the machine for pitch diameter control and to signal the machine for shifting the hob.

The massively built machine offers spindle speeds up to 1000 rpm and readily controlled hob shift of 3 in.

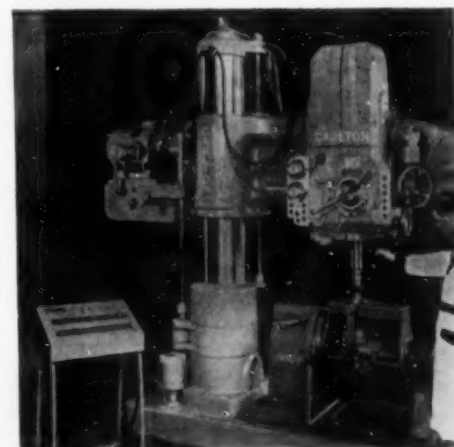
Both the main drive and rapid traverse motors, which are mounted on the top of the machine away from coolant and chips, are JIC approved. **T-9-1974**

Drilling & Tapping

Preselected feeds and speeds and 36 spindle speed choices up to 3000 rpm are features of the new Fosmatic radial drill which is among the machines recently designed by The Fosdick Machine Tool Co. Selection of speeds and feeds, set by means of a dial, may be made while the drilling operation is being completed. The spindle can be stopped, started or reversed without engaging the preselected speeds or feeds. Spindle reverse speed is 40 percent faster than forward speed. Resetting of the dial for deep holes is unnecessary because the feed dial is graduated to full spindle travel.

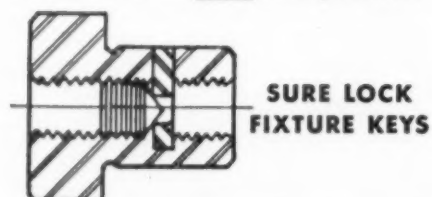
A new arm design offers twice previous strength, while other features include hydraulic column clamp, hydraulic arm clamp interlocked with single-lever control for raising and lowering the arm, and combined arm-elevating lever and head traverse lever. **T-9-1875**

The Carlton Machine Tool Co. is introducing the Carlton-Leber speed-feed preselector and program systems to provide faster, more economical hole drilling production. The programming system permits speeds and feeds to be planned and preset for an entire drilling program. Data on sequence of drilling operations, and the correct speed and feed for each, is recorded on a routing sheet or blueprint, transferred



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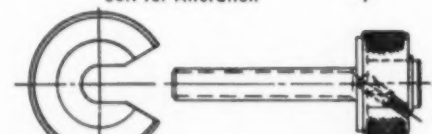
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to the programming console. An indexing dial on the console shows the operation sequence number being performed. The preselector is used for less complicated work. The programmer may be disconnected through a selector switch and the preselector becomes operative. With it the operator may select speed and feed for the next operation while the machine is under cut.

T-9-1881

Snow Mfg. Co. has designed automatic hopper-feed nut tapping machines in 6 sizes capable of producing squareness and parallelism within 0.002 when handling Classes 3 and 4 fits on standard and special nuts. They are capable of actual tapping operations working at a rate of 7200 tapped holes



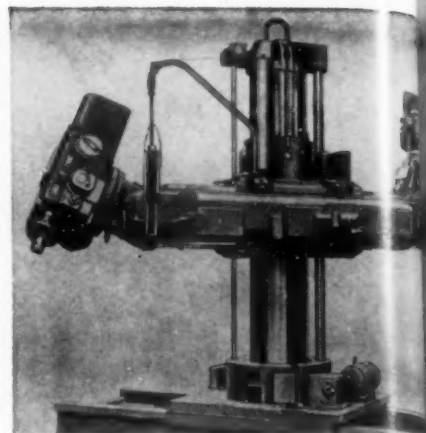
per hour. Automatic features designed into the units permit one operator to run from 6 to 8 units. The versatile range of each machine in the series allows a low tooling cost for change-over to other parts. These same basic machines also can be arranged with a hand-feed, dial index to permit automatic operation of parts that do not lend themselves readily to hopper feed, or they can be had with straight magazine feeds without the dial index arrangement.

T-9-1882

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213 TO REQUEST ADDITIONAL TOOLS
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A compact universal radial drilling machine, Model 140U, developed by Kaukauna Machine Corp., provides compound headstock swiveling features that make it a versatile general-purpose tool for conventional as well as horizontal, angular and compound angular drilling operations.

Special feature of this unit is a pre-select automatic speed shifting mechanism controlled from the pendant station. Over-all size of the machine has



been reduced without reduction of either its capacity or work area. It is designed for either stationary or portable applications.

Also being introduced is the Kaukauna Model 3040 horizontal drilling and boring machine. Design of this unit permits automatic speed and feed selection controlled from a single rotary action direct-reading dial. Dual speed traverse mechanisms of the headstock on the column, and the column on the runway permits the spindle to be positioned with extreme accuracy and speed.

T-9-1883

Its F series of infinitely variable speed drilling and tapping machines, announced by Edlund Machinery Co., include Model 1F offering speeds up to 10,000 rpm, adjustable spindle tension control, 7-in. overhang and 3/8-in. capacity. Model 2F, for medium to heavy work has speeds to 3600 rpm, with an 8, 12 or 15-in. overhang and 1 1/4-in. capacity. A third unit, model 4F, for heavy-duty operations offers speeds to 2200 rpm, a 12-in. overhang and 1 1/2-in. capacity.

T-9-1884

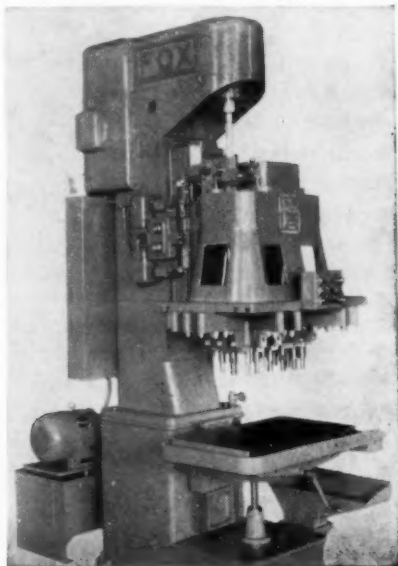
Moline Tool Co. is introducing a vertical, single column, hydraulic feed, universal joint type drilling machine called the model HU110. The 24 spindle drivers contained in the unit each have individual 2-speed and neutral adjustment. The main drive has this same adjustment superimposed on the individual spindle driver speed selection. Pick off gears permit change of over-all speed range. Gearing is so designed that full power of the driving motor can be taken through either right or left group of 12 spindles without overloading. Without construction changes, the entire spindle drive unit together with spindles is applicable to either vertical or horizontal drilling or at any angle between vertical and horizontal.

Another Moline tool, the Model

The Tool Engineer

MD67 straight line type drilling machine offers hydraulic rail feed. Eight spindles can be adjusted along the machine rail for various center distances. Spindle speeds are easily changed by means of 4-speed quick change gear box which permits easy changing of spindle speed in minimum time. Total rated capacity of the unit is thirty-two 3/8-in. diameter drills in mild steel or equivalent load. **T-9-1891**

A vertical multiple spindle hydraulic-feed and individual lead-screw-feed tapping machine is being introduced by Fox Engineering Co. This new machine, the E-60-HT, incorporates a 12 by 24-in. adjustable-spindle head equipped with 16 spindle pinions for 1 3/8-in. universal joints. Pickoff gears located in a case



above the head permit spindle speed change over a range from 202 to 990 rpm.

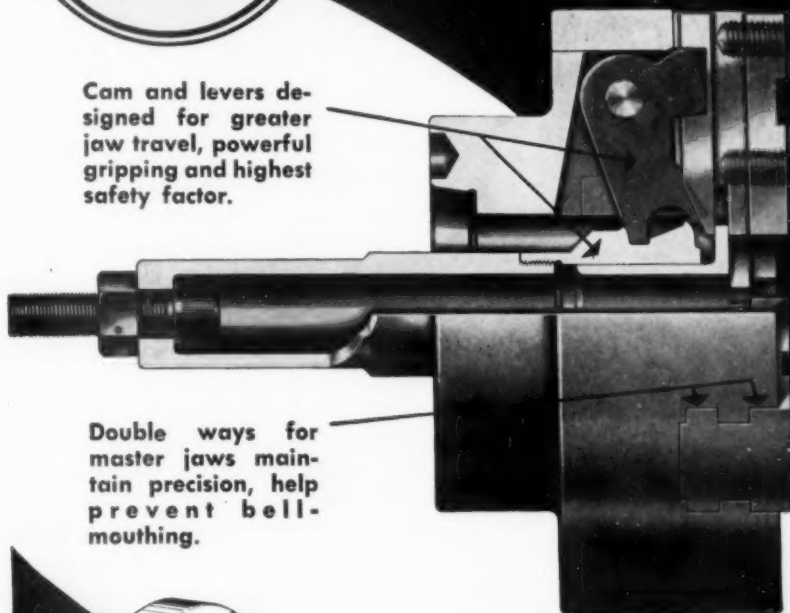
For drilling, drill spindle and arm assemblies are used; for tapping, lead-screw-feed tapping spindles are substituted. Drilling stroke available is up to 12 in.; tapping spindles accommodate up to a 2-in. stroke to give a total of up to 14 in. stroke. Both drill and tap cycles are automatic. Rapid advance and return rates are 158 and 183 ipm respectively. **T-9-1892**

Two new Super Service radial drilling machines, featuring speed preselection, have been developed by The Cincinnati Bickford Tool Co. On one unit, an hydraulic preselector permits choice of 4 spindle speed ranges; 9 different spindle speeds, in each range may be selected by means of a mechanical lever. Other levers provide means of



POWER CHUCKS

Cam and levers designed for greater jaw travel, powerful gripping and highest safety factor.



Double ways for master jaws maintain precision, help prevent bell-mouthing.



More gripping power

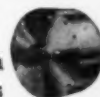
Famous S-P cam and lever design holds the work tighter, permits cost-cutting heavy feeds and multiple cuts. Cam and lever design also resists opening of jaws by centrifugal force or diminishing air pressure... an important safety factor.

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What is the cost of band sawing?

What is the cost of hack sawing?

Let's Find Out in Truth

Many people are currently confused by conflicting claims and so-called "production records" of band saw machine builders and hack saw machine builders; and it is timely that the "air be cleared."

As the **ONLY** American manufacturer who has uninterruptedly built and sold **BOTH** metal-cutting band saw machines and hack sawing machines for more than 37 years, we have decided to boldly "clear the air."

In our Booth No. 416 at the Machine Tool Show, Chicago, September 6th to the 17th, an internationally known firm of test engineers will publicly conduct an unbiased fact-finding test. Under their complete control, a band sawing machine employing high speed steel bands, and a hack sawing machine employing high speed steel hack saw blades will be run continuously on identical work under fixed and rigidly maintained conditions. The result of their unbiased findings, after the conclusion of the test, will be published and distributed to all persons who make request at the Show.

Both the hack saw and band saw machines to be run in this test will be new **MARVEL** models, undergoing their first showing, unquestionably capable of running the blade at the highest speed and the heaviest feed that any saw blade will withstand with reasonable and practical blade life on the test bar selected. The test engineering firm will select the blades to be used from available stock of various brands.

Every precaution will be taken to conduct the test on a strictly unbiased basis. **WE DO NOT CARE** which way this public test may turn the tide, for we, alone, build **BOTH TYPES** of machines — band saws and hack saws. We therefore boldly sponsor this test, seeking **TRUTH**.

Be sure to see it — **BOOTH NO. 416** — The Machine Tool Show.

Of course, our full line of **MARVEL** SAWS will also be demonstrated in operation, to the extent that the limited space allowed us will permit. Other machines, not possible to exhibit in our crowded booth will be available for demonstration at our Chicago plant.



ARMSTRONG-BLUM MFG. CO.

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Drilling & Tapping (Continued)

choosing from 18 rates of power feed. This unit incorporates an improved spindle mounting, an electric traverse to the head with a positive safety to protect the head from damage—among its protective features, the head moving hand wheel does not revolve while the head is being traversed; power elevation to the arm through simplified push button control; and increased spindle



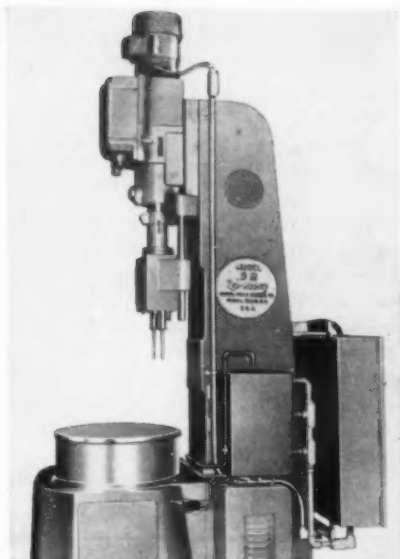
travel. An optional feature of this unit is a hydraulic power head clamp.

The second radial drill features complete preselection of speeds and feeds by means of two dials without need of change levers. Preselection of any speed or feed is possible while the spindle is rotating in either direction during drilling or tapping operations. Instant changes are possible when the spindle is not rotating. There is also a simple direct-reading prescheduling device, which protects the head, as standard equipment for programming any job. **T-9-1911**

Seneca Falls Machine Co. has introduced a model DM automatic drilling and reaming machine, which is made from standardized units assembled on a base casting or welded steel platform.

The unit may be composed of one or several drilling heads which in turn may be equipped with single or cluster drilling spindles. An automatic indexing fixture may be incorporated on the base to rotate workpieces through a series of stations under the drilling, reaming or tapping spindles. Spindle speeds range from 130 to 1150 or 200 to 1750 rpm.

Workpieces are loaded in suitable holding fixtures; when automatic loading is used, two stations on the indexing table are reserved for loading and un-



loading the parts. Maximum feed of the head is 16 in. Drilling area of the head is 20 by 19 in.

The machines may be equipped with a full automatic cycle including automatic "pickup" from a conveyor line, automatic loading, machining and indexing and finally automatic ejection of the finished part on another conveyor line. **T-9-1912**

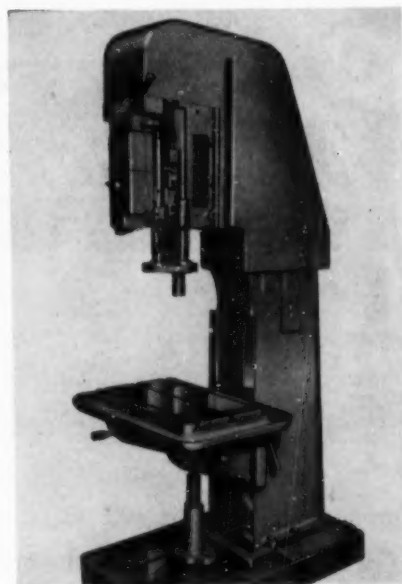
The new Cleveland Jr. multispindle drill tapper, being presented by The Cleveland Tapping Machine Co., is designed for highly flexible, efficient, accurate and economical multiple small hole drilling and tapping. A universal-joint head affords maximum flexibility in bolt circles or arrangement of spindles. Up to 8 No. 24 holes may be drilled or as many as 8 No. 10-32 holes may be tapped within a maximum bolt circle of 8 in. The standard unit has 8



spindles adjustable to a minimum distance of 11/16 in. between spindles. In drilling, the motor operates continuously in one direction; in tapping, a reversing switch reverses the motor to withdraw tools when desired depth of stroke is reached. **T-9-1913**

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The Barnesdril model 64 hydraulic drilling machine made by Barnes Drill Co. incorporates a self-contained hydraulic unit with 2 rates of feed and rapid approach. Readily applicable to single-purpose operations with an au-

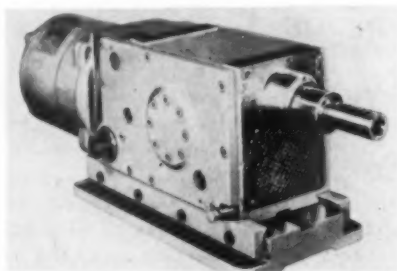


omatic cycle, it has 1500 lb thrust and a rated capacity of 3/4 in. in steel. Feed rates range from 1 to 22 ipm. Spindle speeds range from 500 to 1725 rpm by selection of sheaves. The unit also has been designed to accommodate an auxiliary head.

In addition, Barnes Drill is announcing a heavy-duty drilling machine, the 7/8 UB, available in 4 different models. It has 4-speed geared transmission and back gears to provide 8 speeds ranging from 251 to 2900 rpm. Sheaves speed range from 58 to 4350 rpm. The other models of this machine include a special-purpose drill with single speed, a toolroom drill with 4-speed motor, and a semigeneral-purpose drill with 4-step sheave V-belt drive to provide 4 speeds.

The machine has a sliding head with 7-in. travel and standard spindle stroke of 7 in. Other features include a direct-reading dial for selecting depth and electrically controlled feed engagement. **T-9-1914**

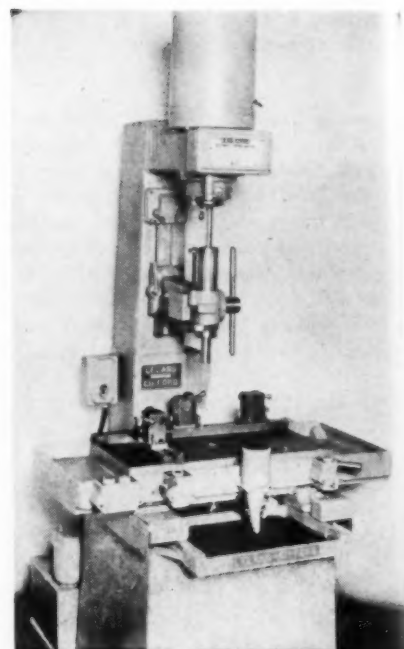
Two new cam feed drilling and two cam feed tapping units are being announced by Kingsbury Machine Tool Corp. Spindle speeds of the drilling machines are 596 to 3500 rpm and 750 to 8200 rpm; for the tapping units they are 388 to 2280 and 500 to 2732 rpm.



Features of the designs are increased strokes, complete automatic lubrication and an auxiliary cam lever for operating sequence controls. Speed and feed changes are by means of pickoff gears. Tripping and synchronizing may be either pneumatic or electric. **T-9-1921**

An innovation in drilling machines, which permits locating and drilling of holes without jigs or fixtures and without laying out individual workpieces, is announced by Leland-Gifford Co. The machine is particularly adaptable for producing experimental parts, small quantities of duplicate pieces or even production quantities that might tie up more expensive equipment.

The work table, with a work surface



of 14 by 28 in., has a movement range of 10 in. front to back and 15 in. side to side. **T-9-1922**

Automation

AND LAPEER AIR-OPERATED CLAMPS

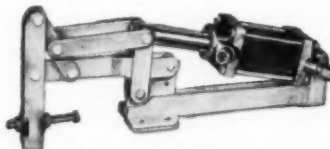
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MODEL AO-400

Toggle Clamp for conventional clamping. Superimposed line drawing illustrates the AODT-400 for such difficult mounting situations as when the cylinder interferes with conventional clamping.

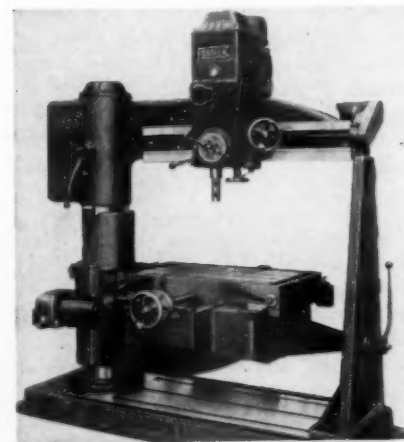
4719

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A new sensitive radial drill layout machine which also may be used as a radial drill is announced by The Fostick Machine Tool Co. The unit combines a high-precision jig borer table



with a Fostick sensitive radial drill. Design permits the table to be moved accurately across the knee. Table movement in and out is 18 in. An outboard support connects the end of the arm with the base to give necessary rigidity for accurate work. Power elevation travels the table vertically through 16½ in. **T-9-1923**

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Gaging & Inspection

Covel Mfg. Co. has developed an optical comparator, the No. 14, which provides a 14-in. diameter screen that gives a clear halo-free image. Accurate measurements may be taken by direct



readings from the Swiss-type dial indicators. A 25X lens is furnished as standard equipment, while 5 other lenses from 10 to 100X are available.

The top stage, which has a working area of 13 by 6 in., moves 6 in. horizontally and 2 1/4 in. vertically.

T-9-1931

Low-cost master ring gages made within ± 0.0002 in. of any specified size, with their exact size to 4 decimal places shown on the master, are announced by Size Control Co. These tools, called Boremaster, are used for gaging and setting indicating bore gages and inside micrometers. They are accurate to 0.0001 in. in roundness, straightness and taper, nonaccumulative. The master rings are made from 0.1870 to 3.000 in. with larger sizes available in AGD tolerances.

T-9-1932

A multi-dimension gaging machine, the Sigmatic, developed by Pratt & Whitney, Div. of Niles-Bement-Pond Co., is an automatic gage capable of simultaneously inspecting as many as 50 physical dimensions with accuracy and speed. It can be adapted to inspect, count and sort a wide variety of components manually, semiautomatically or completely automatically.

It is made up of standard basic units which provide interchangeability that makes possible inexpensive, quick and efficient changeover of tooling for specialized gaging of work from either short or long production runs.

Two standard gaging heads are

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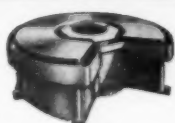
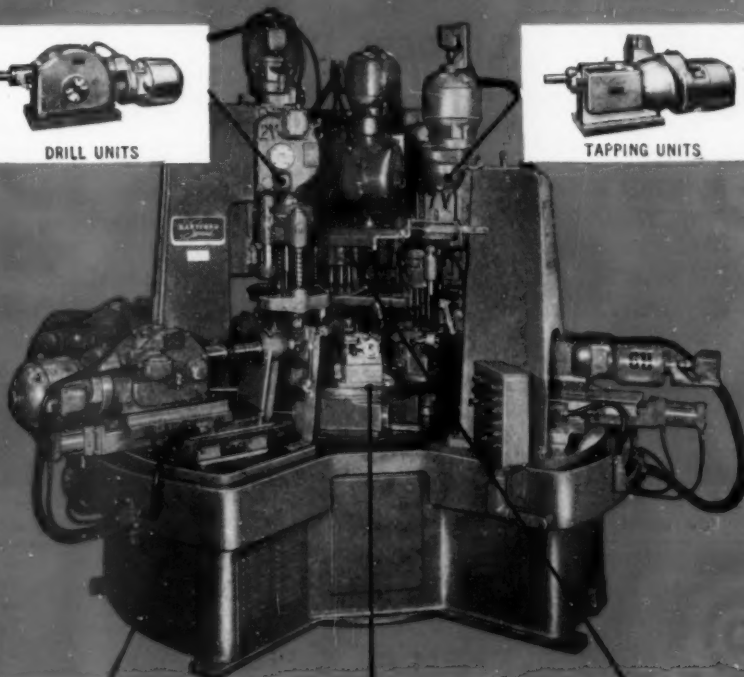
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DRILL UNITS



TAPPING UNITS



BASES



INDEX TABLES



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available—the Micro-Air and Micro-Limit. The former, with Liquicolumn panel unit, provides positive dimensional readings on a compact panel arrangement; the latter, with light signal panel unit, gives plus, minus and okay signals for each dimension. The Micro-Limit gage can be wired to the producing machine to cause it to stop when producing out-of-tolerance pieces.

T-9-1941

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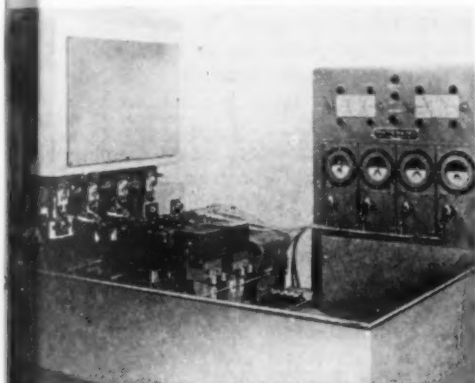
Two 14-in. screen optical comparators in a floor and a table model, made by Jones & Lamson Machine Co., are designed for precision and rigidity and to meet exacting qualifications of optical inspection. Angle measurements are read direct to the exact minute. All lens systems (from 10 to 100 X)



ve 6½-in. focal length for clearance the staging area. Lenses may be mounted singly or in a 6-position turret inside the machine for quick selection. The screen is set at a 10-deg angle for ease in using overlay charts.

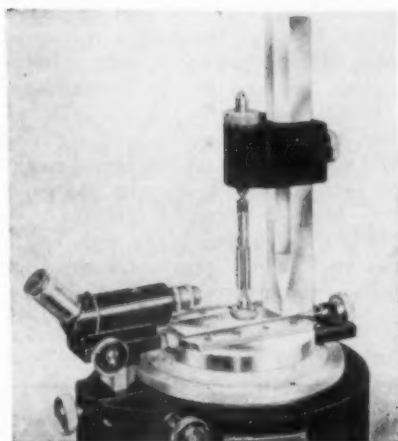
Two reflection attachments are available; one provides an acute angle light source on each side of the projection lens; the other allows reflection inspection of deep holes, shoulders and polished surfaces. Vertical projection tables allow parts to be staged on a glass surface with coordinate travel of 3 by 4 in. Measurements to 0.0001 are possible. **T-9-1951**

An automatic machine control gage that provides in-process gaging and automatic feedback correction, has been developed by Pratt & Whitney, Div. of Niles Bement-Pond Co. The gage, called Air-O-Limit, allows for step impulse changes to the machine controls for tool resetting to maintain tolerances. Rejects will cause the machine to stop. When mounted on an automatic dual boring machine, for example, the con-



trol unit is mechanically, electrically and functionally a part of the boring machine. The gage checks each workpiece to a 0.003-in. maximum tolerance, while the machine maintains a production rate of 120 pieces per hour. Light signals at the main control cabinet give out-of-tolerance warning, while four standard package gage units with calibrated air indicators show direct diameter diameter. **T-9-1952**

The new optical tap checker, designed by Hanson-Whitney Co. for checking chordal hook or rake angle, is easily adjustable for all types and sizes of taps, from the smallest up to and including 2 in. in diameter spiral pointed, spiral fluted or tapered. Both external and internal centers are furnished as

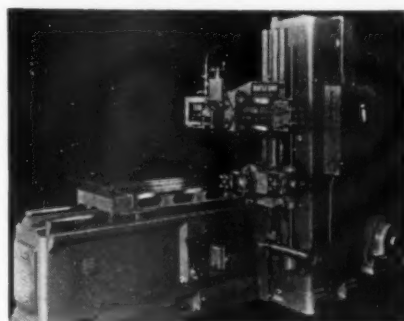


well as a V block for use with taps having no working centers. The checker provides rapid and accurate quantity inspection through direct reading. **T-9-1953**

Shapers

Rockford Machine Tool Co. has introduced an Openside hydraulic shaper that offers planer accuracy and easy setup for all types of large-size shaping work. It provides maximum flexibility, while fast production of high-quality work are outgrowths of the hydraulic drive and hydraulic feed.

Because it reciprocates the workpiece



instead of the cutting tool; this machine will accommodate unusually long work. All work is carried on the solidly supported box section table. A side head also is available. **T-9-1954**

The Cincinnati Shaper Co. has designed a new 42-in. all-steel shaper that provides unusually high accuracy, metal removal and performance. Among its features are 44-in. max. stroke with a simple method of adjustment. Sixteen constant cutting speeds range from 25 to 400 fpm. Full helical, constant-mesh transmission has hydraulically operated internal clutches. Smooth action at high speeds is assured because energy is recovered on reverse stroke and

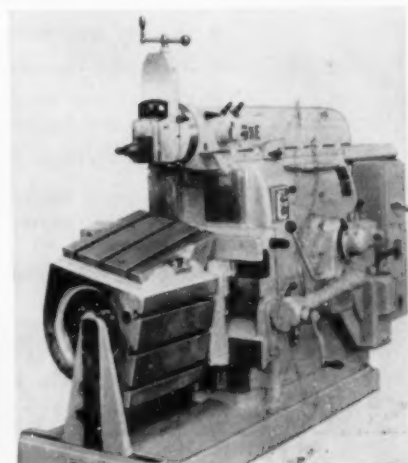


clutches are relieved of reversing the load. A single lever control from either side of the shaper provides instant reverse at any point of the stroke. Five angular feeds with a rotating table give accurate shaping of any angle.

The 16-in. rigid shaper is a new tool in the Cincinnati Shaper line. Greater accuracy and heavier cutting is possible because of its increased rigidity. Features of the tool include slot-free modular iron ram which requires no clamping or stroke adjustment, brushless electromagnetic brake and clutch which need no adjustment, an automatic tool lifter and a hydraulic follower. **T-9-1955**

A 24-in. special ram-type hydraulic shaper made by Rockford Machine Tool Co. offers efficient, economical production shaping. Design features include infinite speed and feed control, abundant power and fine accuracy. Dual controls, and an unusually fast and simple stroke change are additional advantages. Sizes available include 12, 16, 20, 24 special, 24 heavy-duty and 28-in. sizes. **T-9-1956**

Latest model hydraulic slotter made by Rockford Machine Tool Co. offers high ram stroke speeds, infinite speed adjustment, hydraulic feeds, and spe-



cial convenience features for operation and control. This model SA, with 12 and 20-in. stroke, has hydraulic fulcrum drive to the ram and 90 deg. table indexing. The table has rotary, transverse and longitudinal feed and rapid traverse.

T-9-1961

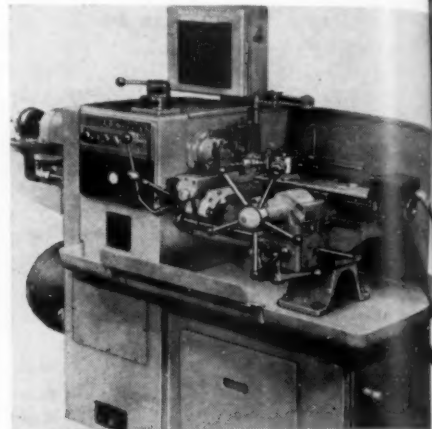
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Gould & Eberhardt, Inc. has introduced a shaper featuring a reinforced and stiffened ram with both a longitudinal rib and heavier crossribbing. There is no slot in the ram. Deflection has been minimized. A separate and positive ram lock has been brought forward adjacent to the ram positioner for easier operation. A multiple disk electric clutch and brake with single fingertip control provides convenient, instant and positive starting, stopping and inching.

T-9-1962

Lathes

Jobs requiring cross slide forming, roll stamping, turret drilling, step counterboring, recessing and tapping in lot quantities of 1000 to 2000 pieces, may be economically accomplished on the new No. 1 electro-cycle ram type turret lathe developed by The Warner & Swasey Co. This fast, quickly set up, easily operated hand machine is de-



signed to meet high-speed requirements on bar jobs up to $\frac{5}{8}$ in. diameter. Back gears and a high-speed headstock permit turning speeds up to 4000 rpm, with lower speeds instantly available when needed for threading and forming work.

The 3-hp, two-speed drive motor transmits power through a series of quick-change sheaves which provide a wide choice of speeds. Automatic spindle control is used for all spindle functions, with setup conveniently handled on a special toggle switch control panel mounted on top of the headstock. Once the automatic control panel is properly set, the operator has only the cross slide and turret to regulate during machine operation.

Six power feeds ranging from 0.0015 to 0.15 in. are provided. An electrically powered automatic collet chuck and bar feed increase operating ease and speed.

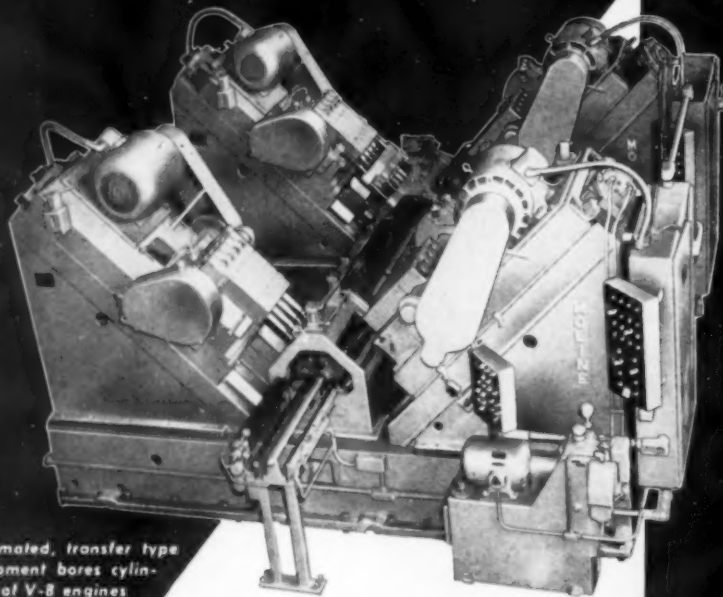
T-9-1963

Several new lathes announced by The R. K. LeBlond Machine Tool Co. include the 25/50 in. sliding bed-gap lathe featuring a sliding bed arrangement to allow a variable gap for turning a variety of unusual sizes and shapes. The bed also may be extended to handle extra-long workpieces. The 36 spindle speeds range from 5 to 625 rpm. Adjustable acceleration is provided for starting, stopping and jogging heavy workpieces.

A 16-in. heavy duty engine lathe announced by LeBlond offers 27 spin-

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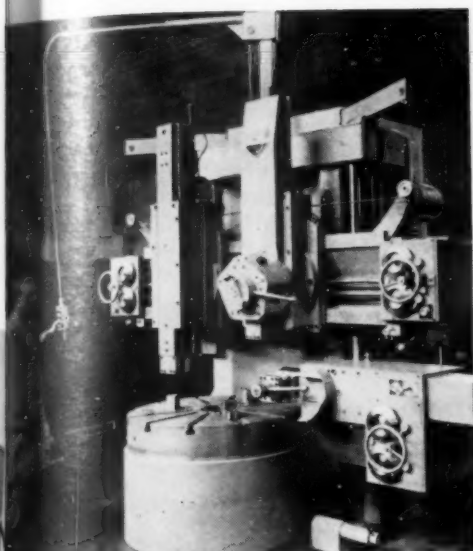
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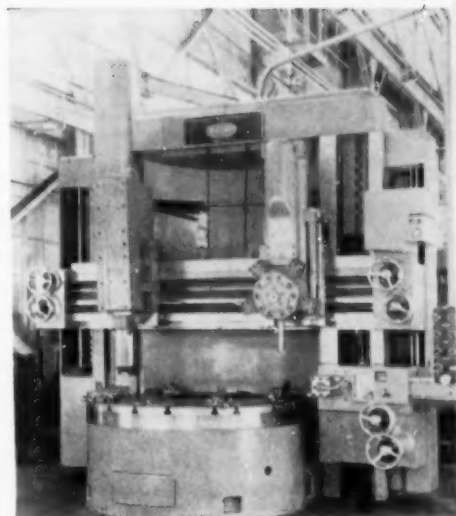
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traverse. Heads also have coaxial micrometer dials and circular scales. A 5-position turret can be indexed in either direction, and a safety device prevents movement of the turret except by use of the index crank. Extra angle-cutting capacity between 30 and 60 deg is possible because of an independent feed reverse feature. Head settings are easily adjustable to within one minute of arc. **T-9-1973**

Convenient movable pendant control that directs feed and traverse of all heads, selection of table speed rates and indexing of powered turrets is the main feature of The Bullard Co.'s 76-in. Cut Master vertical turret lathe. All heads of this unit, Model 75, have



dle speeds from 16 to 2000 rpm through a combination gear-belt drive head-stock. Of the speeds, 18 are gear driven and 9 are obtained through a Gilmer-type belt. Speeds are quickly and easily chosen with the aid of a color plate. A heavier apron incorporates 4-directional power rapid traverse which moves the cross slide in and out and the carriage lengthwise in both directions by a single lever. **T-9-1971**

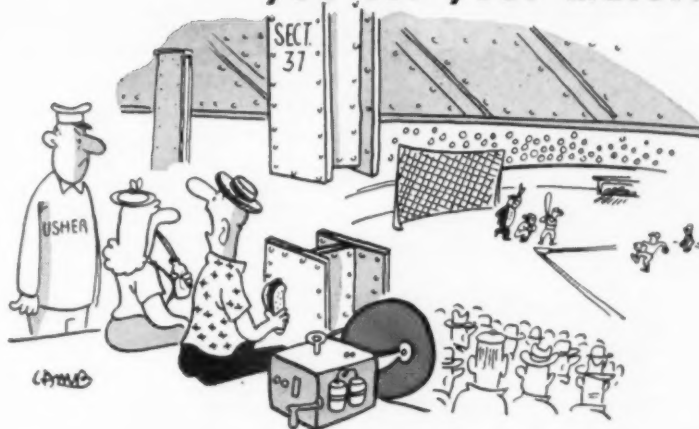
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Several unusual features are incorporated in the new 60-in. model APT Lo-Swing tracer lathe manufactured by Seneca Falls Machine Co. They include a completely automatic cycle plus automatic change-over from rough to semifinished to finished turning. Design also permits unlimited travel up to full bed length.

Another model, the LRT Lo-Swing lathe designed for chuck work, features a short, platen-type bed, fully automatic cycle and built-in longitudinal and cross feeds at angles which can be suited to the work. **T-9-1972**

First of a new line of vertical turret lathes is being introduced by Giddings & Lewis Machine Tool Co. The line features instant powered remote control shift, directional control of feed and traverse movements, and screw-fed rams. Each head has independent feed and traverse with directional control to both ram and saddle. Specially designed standard swiveling turret and swiveling ram heads are counterbalanced for easy motion under feed and

cut your costs . . . where you cut your materials



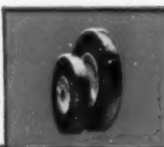
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Forging hand-loaded chuck with crank pin end out . . . indexed to work station to turn and chamfer pin, face shoulder, cut relief for grinding.

**TURNING BOTH ENDS
OF A CRANKSHAFT
FORGING . . .**

**IN ONE CONTINUOUS
OPERATION . . .**

**ECCENTRICITY LIMIT
OF SHAFTS .001"**

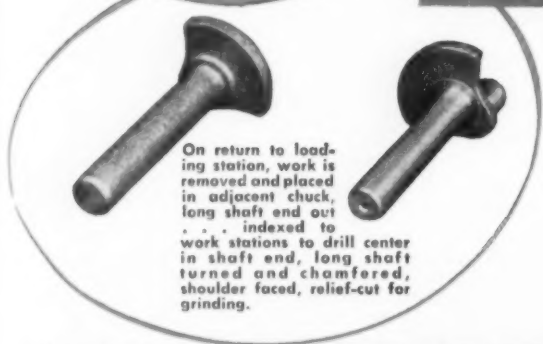
**PRODUCTION
151 PIECES
PER HOUR**

The Baird 76H Automatic Chucking Machine is set up for double indexing with alternate chucks (6-7 inch) arranged to receive the shafts for (first) operating on the

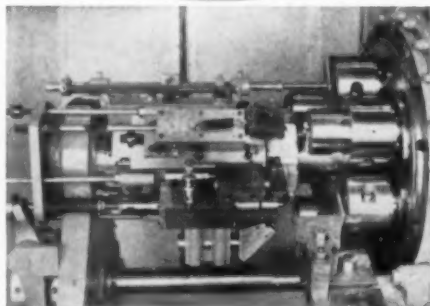
crank pin end and (second) operating on the long shaft end.

Also provided are a relieving motion mechanism to cut relief for grinding on pin end . . . a 3-to-1 reducing motion for center drilling . . . and a live center attachment to support the long shaft end while turning.

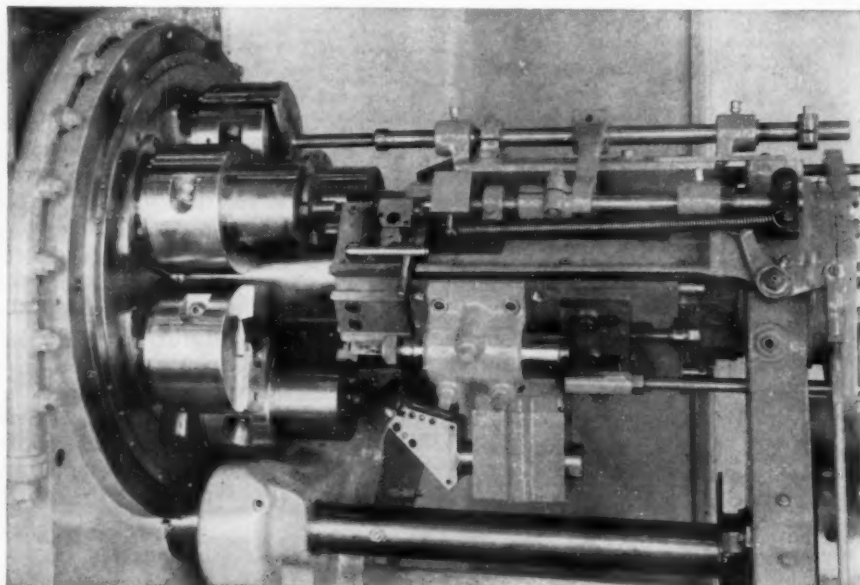
This is indeed automatic high production . . . the type of machine and tooling that can put many a manufacturer in a favorable competitive position. If you have similar parts to produce, "Ask Baird about it!" Write to Dept. TE.



On return to loading station, work is removed and placed in adjacent chuck, long shaft end out . . . indexed to work stations to drill center in shaft end, long shaft turned and chamfered, shoulder faced, relief-cut for grinding.



ABOVE: Rear view of tooling set-up.



RIGHT: Front view of tooling set-up.

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78A95

Lathes

(Continued)

crew feed in both directions. A further feature of the machine is the combination radial and thrust roller bearing for table support which makes greater accuracy at higher speeds possible.

Compliment to this machine, is the 26-in. Cut Master, Model 75, which has been converted to completely automatic operation by installation of a Man-Au-Trol conversion unit. This automatic attachment, consisting mainly of two rotary detector drums and a function drum which are electrically controlled, directs the machine through all functions which the machine is capable of performing. **T-9-1991**

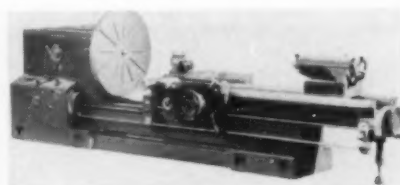
A new lathe featuring a top tracer has been designed by Hydra-Feed Machine Tool Corp. Location of the tracer

precision parts at lower costs. The headstock, capable of 40 hp input, provides extra power to utilize carbide tooling to best advantage. Chuck sizes are 18, 24 and 30 in. Job versatility is increased by the wide range of speeds (23 to 470 rpm) and feeds. Spindle and slides are pushbutton controlled for faster, more convenient setup, while the control drum design simplifies changeover and provides full automatic control of machine functions.

Another P&J automatic turret lathe, the 4-U, built for fast metal removal by carbide cutting tools, incorporates several design features. Strong, transparent splash guards provide improved protection while giving the operator a clear view of the work and slide out of the way for setup or loading and unloading. Large spindle diameter insures rigidity. There are 6 automatic feed changes and 4 automatic speed changes from 45 to 1177 rpm. **T-9-1993**

A multicycle single point production lathe, model 14, is designed by Sundstrand Machine Tool Co. for single point turning of shafts. It is equipped with a 2-position turret so that rough and semifinish cuts can be taken with a roughing tool and a finish cut with a finishing tool in one automatic cycle. Three cuts can be taken on each of 8 different diameters at 8 different speeds in one automatic cycle. Easily positioned shoulder facing tools carried on the front carriage are operated independently and can come in at any time during the automatic cycle. This unit is particularly easy and fast to set up. **T-9-1994**

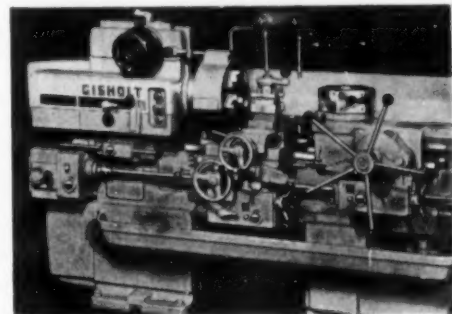
Nebel Machine Tool Corp. has announced a new 20/40-in. gap lathe, the Imperial, which swings 24½ in. over the ways and 42 in. through the gap. With a single-speed motor, it delivers



18 spindle speeds; with a 2-speed motor, 36 spindle speeds. Selection of 60 feeds and threads is provided through a special direct-reading speed selector. All heavy components, including the tailstock and sliding upper bed, are power actuated so no operator effort is required to move them. **T-9-1995**

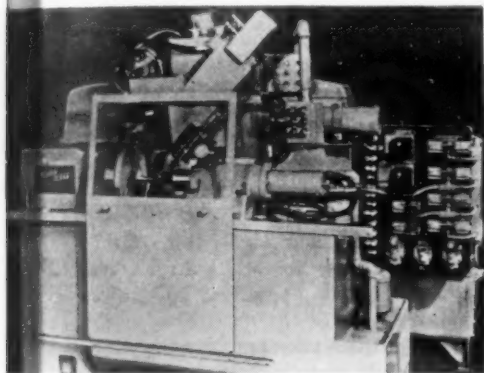
The National Acme Co. has announced a 4¾ in. Model MR single spindle bar-type turret lathe, that will perform 15 operations is also announced. This unit will, for example, perform 15 operations using carbide tooling to complete 20 finger holder spools an hour from 4620 steel tubing in a machine cycle time of 3 minutes. A cycle timing drum provides fully automatic control of 6 predetermined spindle speed changes and 3 selected feed ranges as well as spindle reversing during the complete machining cycle. **T-9-1996**

A new line of ram-type turret lathes which offer greater horsepower, higher speeds, increased swing and easier operation, is introduced by Gisholt Machine Co. Four models in this line include the No. 3 Electram which features the Gisholt-Weatherhead chuck which power indexes the workpiece without stopping the spindle. It can,



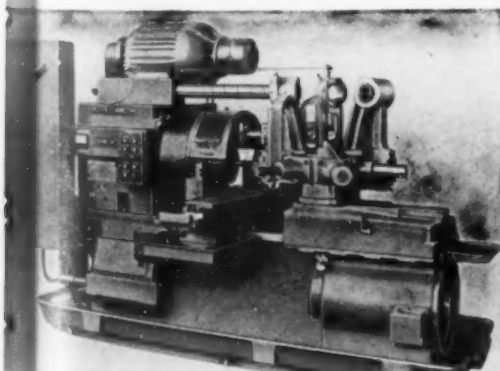
for example, machine all ends of a small tee fitting in a single chucking of the part. A second model (illustrated) incorporates a hydraulically operated bar feed and collet chuck. Third model of the line, the No. 5, features a new hydraulic pressure tracer unit, the Jet-racer, mounted on the rear of the cross slide. A Big Bore No. 5 model provides a small machine which will handle large work of nonferrous material.

At the same time, Gisholt announces its automatic production lathes for single-spindle chucking. This line includes: the No. 12 horizontal with traverse worm shaft, using the Jetracer and indexing tool; the No. 12 vertical which adapts to faster handling from either pallets or conveyors; the No. 12 automatic with automatic handling, gaging and tool setting plus other features for completely automatic operation; the No. 24 automatic which provides pushbutton operation for loading and unloading from conveyor, operates an automatic machine cycle, and features integral chip disposal; and the Simplimatic designed to permit simple tooling to do a complex job. **T-9-1997**



slide and template on the top carriage prevents dirt or chips from interfering with maximum lathe efficiency. **T-9-1992**

Potter & Johnson Co. has announced an automatic turret lathe, the Model 6-DRE-40 developed from the basic P&J 6D automatic design, to provide rapid production of hard-to-machine



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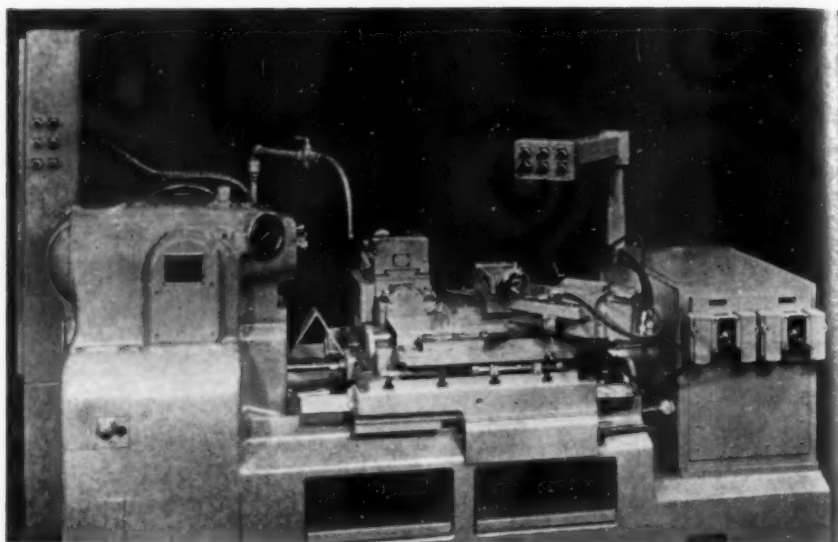
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INDICATE A-9-200



A production chucking lathe for first and second operation work, called the Monarch Hydra-Slide, is announced by The Monarch Machine Tool Co. Fully automatic cycle control of all cutting tool movements is featured in this unit which provides work diameter capacity up to 15 in. over the front slide and up to 13 in. over the rear slide. Both slides are hydraulically actuated. The front slide, which is equipped with an air gage tracer unit, is used for facing and contour turning or boring; the rear slide is designed for necking and grooving and, with special tooling arrangements featuring built-in automatic hydraulic tool relief, is useful for facing.

A platen incorporating hydraulic transverse movement is employed as

the mounting member for the front and the rear tool slides. Movement of the platen permits retraction of the tool slides from the work quickly at the conclusion of the cutting cycle for rapid change of workpiece. Once the next workpiece is chucked in place, the platen returns the tool slides to the cutting position.

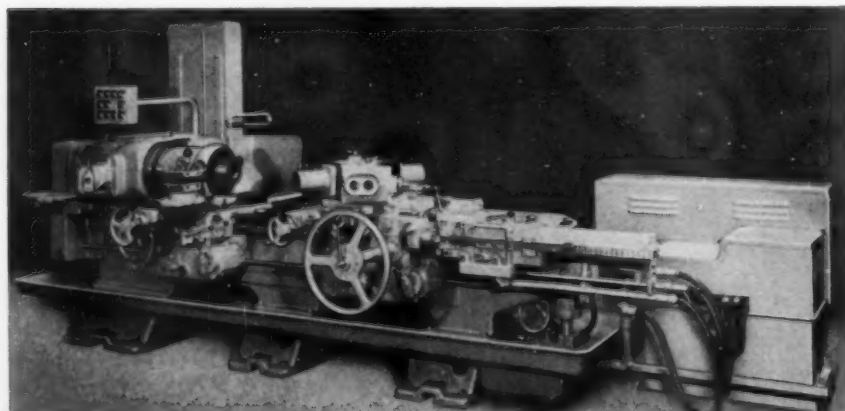
The Air Gage Tracer, mounted on the front slide, allows a single continuous tool cut to be utilized to impart a fine, stepless finish to the workpiece.

Because the new Hydra-Slide lathe combines both tracer control and automatic cycle operation, successive duplicate pieces can be turned with accuracy in minimum machine time. Request details directly from Monarch.

Jones & Lamson Machine Co. has introduced a saddle type lathe with automatic numerical tape control. For operation of this unit, model 7A-2-1/2, information taken from specifications on drawings of the part to be machined is put on punched tape. Tools, preset to gages, make it possible to select a

part, punch a tape, set the tools and make a part without further tool adjustment.

The universal turret lathe with cross sliding hexagon turret, manufactured by Jones & Lamson can be operated as a standard machine. A selector switch provides advantage of



2-way tracer capable of machining inside and outside contours on backed work. Template control of stylus provides tool travel in any direction within its plane toward the headstock, from a cut parallel to the spindle center line, to a face 90 deg to the center line.

Sequentially controlled machine to hog off metal up to 1/2 in. in depth in 1, 2, 3 or 4 automatically controlled tracing cuts has been developed by Jones & Lamson. This heavy-duty automatic tracing lathe has a two-position automatic indexing toolholder on the tracing slide of the carriage which permits heavy roughing with one tool and accurate finishing cuts with the other. Feed and speed changes may occur automatically during a cut to assure optimum cutting speeds on changing diameters and angles, and to permit roughing at one speed and finishing at another. The headstock has 16 spindle speeds with automatic 2 to 1 or 2 1/2 to 1 speed change undercut.

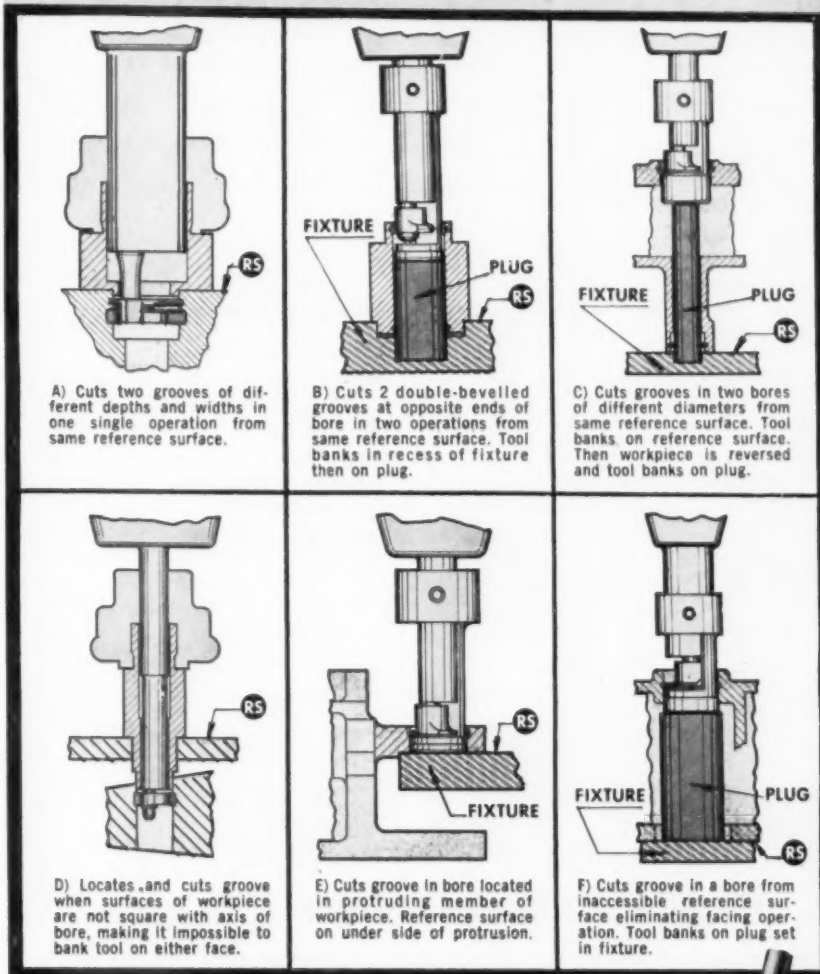
Automatic features of handling; chip disposal; gaging; sorting of workpieces according to acceptable, oversize and undersize, and tool adjustment to compensate for wear and maintain finished size, are incorporated in the Fay automatic Self-Resetting lathe developed by Jones & Lamson Machine Co. The turning tool is automatically adjusted by moving it in and out through a total range of 0.0020 in. radially by steps of 0.0020 in., or by rotating it in 100 steps to use the entire periphery of the cutting edge. Operation of the unit approaches continuous process control, anticipating variations outside allowed measurement limits and providing for corrections to be made in advance.

T-9-2011

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

The 16-in. Powerturn toolmaker lathe developed by Lodge & Shipley Machine Tool Co. incorporates a computing head which requires only the setting of 2 dials to immediately indicate the correct settings for 3 speed-shifting levers. Another feature of this lathe

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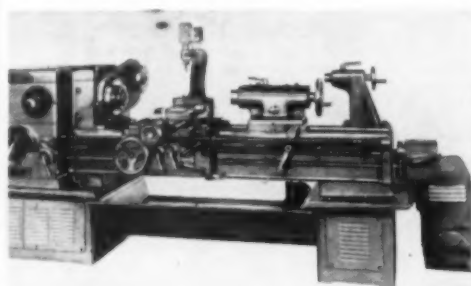
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is the Centri-trol design which has conveniently grouped all controls, which have been shaped for fumble-free operation. Among other design points are the positive brake, built-in horsepower ammeter to indicate amount of lathe's capacity being utilized, greater swing over the cross slide, micrometer carriage dial to show movement in 0.005 in. **T-9-2021**

The Sidney Machine Tool Co. has developed a Model 32 Dial-Matic engine and toolroom lathe which provides simple and convenient single dial control of all working units including the headstock, gearbox and apron. Increased swing capacities plus greater



rigidity of the unit, and the Dial-Matic controls, offer greater production capacity with less operator fatigue.

This same model may also be equipped in a matter of seconds with a fluid tracer unit without adding or removing any parts or units. This addition permits the lathe to be operated as a contour duplicator or as a standard engine lathe by traversing the tracer head to the rear of the carriage cylinder slide. On the Sidney lathes equipped with the fluid tracer unit, there is no loss in swing capacity over the compound rest. **T-9-2022**



Internal Grinders

Development of a vertical precision hole grinder, the No. 2E, by Pratt & Whitney, Div. of Niles-Bement-Pond Co. provides a unit that will grind straight or tapered holes and radii at a speed ranging from 4,000 to 100,000 rpm with extreme accuracy. In this unit, work is strapped to a table and does not revolve. The grinding wheel has a planetary motion about the vertical axis of the hole being ground and can be fed outward in an increasingly

larger radius while the machine is running. Table settings accurate to 0.0001 in. may be made quickly and dependably. Three interchangeable pneumatic grinding heads are available: two are air turbines and offer speed ranges infinitely variable from 60,000 to 100,000 rpm and 30,000 to 50,000 rpm respectively. A third, solid piston type head provides speeds from 4,000 to 9,000 rpm and is used for grinding holes from 6 to 10 in. in diameter. **T-9-2023**

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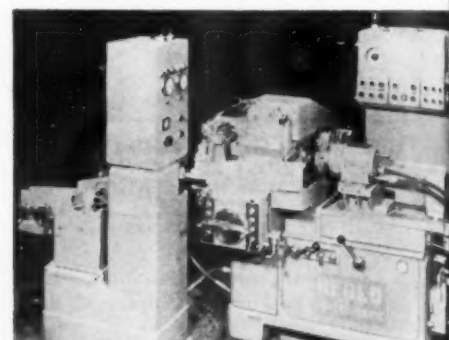


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Three completely automatic high-production grinders being introduced by The Heald Machine Co. include Models 190 Centri-Matic bore grinding unit, 1901 Centri-Matic ball track internal grinding machine and 170 automatic chucking internal grinding machine. All three employ self-adjusting



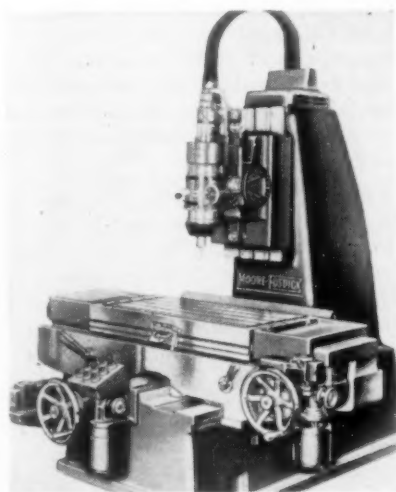
grinding cycles through a feedback system. Only attention they require are periodic wheel changes, for which they shut down automatically and flash attention lights.

On the 190, parts are located and rotated on the ball track using hard shoes. Rotation is by frictional engagement with a rotating backing plate. A rotary diamond with self-compensating cycle avoids need for diamond adjustments and maintains a uniform wheel dress at all times. This unit also

incorporates air gaging, inspection and setting, with a mechanism that shuts down equipment when a predetermined number of pieces run outside tolerances. All three models are designed to tie into automated lines. **T-9-2031**

The automatic positioning jig grinder announced by The Fosdick Machine Tool Co. combines the Moore jig grinding head with the Fosdick positioning table. Result of this combination is greater capacity for precision grinding plus speed and convenience of a table that automatically positions work to ± 0.0001 in.

Special feature of the tool is its ability to grind cylindrical and conical



holes with taper in either direction. An angular and indexing device built into the main spindle and the recently developed shot grinding attachment permit quick accurate grinding of any regular or irregular contour. Grinding speeds range from 12,000 to 60,000 rpm.

With the Fosdick automatic positioning system, measurements are made simply by setting dimensions from the blueprint on direct reading dial drums.

T-9-2032

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

A semiautomatic internal machine developed by Parker-Majestic Inc. for use either as a conventional internal grinder or for automatic operation is adaptable to most jobs in the average plant. Two models are available, each with a 10-in. swing over the table; one has table travel of 12 in. and the

second a table travel of 24 in. Travel is manual powered by a gear and rack actuated movement, or electromechanically controlled. Rates of speed of 12, 24, 36 and 48 ipm are available. Fourth means of actuating table travel is by a lever arm mechanism, the Reciprocator, which enables table stroke from 0 to 3 in. at rates of reciprocation of 30, 50, 75 and 100 strokes per minute. Design is such that spindle infeed is a direct function of table reciprocation. A specially designed wheel dresser

helps assure initially obtaining of proper hole size.

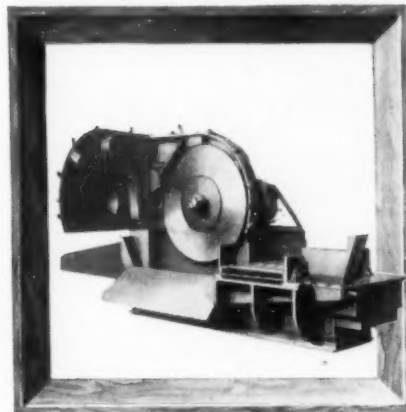
A second new Parker-Majestic tool is its No. 2 surface grinder. A handwheel controlling vertical elevation of the spindle is incorporated into the cross-feed saddle of the machine. One complete turn of the wheel imparts a vertical movement of 0.010 in. to the spindle. The wheel is cranked by a motor. Seven spindle speeds of this multispeed unit range from 2200 to 6000 rpm. **T-9-2033**

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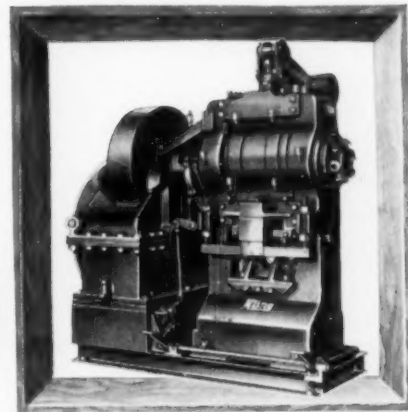
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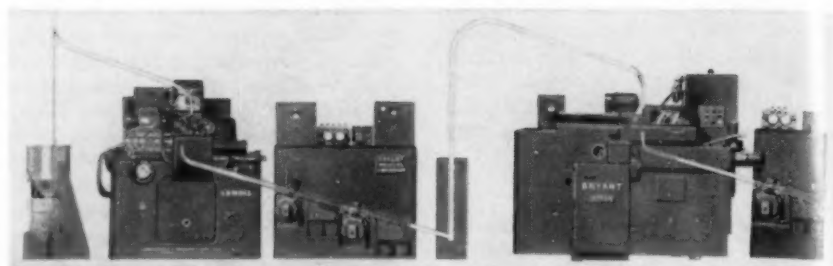
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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-203

An automatic cam-operated internal grinder with a constant rate of operation, announced by Bryant Chucking Grinder Co., is particularly suitable for integration into automated production lines. It can be combined with a Landis No. 4 Concentric grinder, for example. Bearing races are ground on the outer race in the Landis grinder, then are automatically transferred to the Bryant 2209-Y where the bore is ground. Work handling and operator attention is minimized. Correction signals are sent by a post-gage, which automatically checks the ground parts, to the Bryant Process Controller, which



in turn makes necessary changes in the Landis machine setting to produce correct part size. The Bryant Process Controller is a statistical machine con-

troller that assures the parts being ground are within desired tolerance limits. It also checks trends with corrections being made before parts fell outside of tolerance limits.

A shoe centerless fixture and magnetic drives used for rapid loading and unloading of this grinder avoids distortion of the workpieces, particularly those with thin wall rings which are easily distorted with ordinary clamping devices. With the magnetic driver there is no need for roll clamps on the face of the workpiece thus shorter and stronger wheelhead projections may be used.

Among other grinders developed by Bryant Chucking Grinder is a hydraulic internal unit which offers maximum accuracy and efficiency in combined bore and face grinding. This model, 1316-J, performs two or more operations at a single chucking while holding concentricity and squareness of ground surfaces to close tolerances. Port plates, for example, can be ground at a production rate of 40 pieces per hour at 100 percent efficiency with flatness tolerances of 0.0003 in. **T-9-2041**

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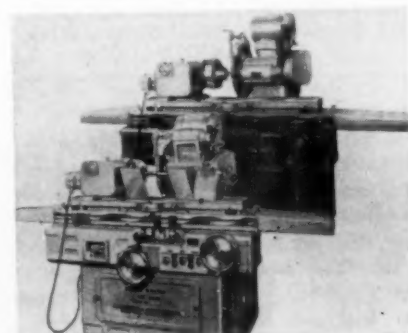
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The No. 1230 universal cylindrical and internal grinder is built by Gallmeyer & Livingston Co. particularly for plants having a wide variety of work that otherwise would require specialized machines for each type. The new precision tool is capable of making either rough or fine finishing cuts. Con-



and adjustments are designed for loading ease. Cabinet base gives stability of alignment; work carrying table is mounted directly on the fixed ways without an intervening cross traveling saddle. Hydraulic operation of the table provides infinitely variable speeds from 3 in. to 50 fpm.

A circular turntable, on which the machine table is mounted, is graduated in degrees and a taper foot scale is mounted at the end of the table. The internal spindle and drive built into the wheel head is instantly available without complicated setup. **T-9-2051**

External Grinders

Among grinders designed by Besly-Wells Corp. is a new development identified as Model No. 240 double horizontal-spindle grinder for fast, high-precision work. An electromagnetic feeder incorporated in the unit delivers work between the disks in a steady stream. Because of this simplified ar-

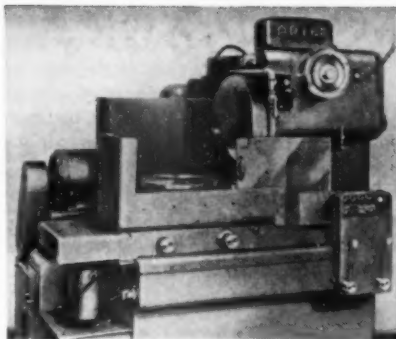


table travel to grinding position, table reciprocation under the wheel, coarse feed for rough grinding, fine feed and spark-out period for finishing and automatic retraction of the wheelhead and table.

Grinding is by the periphery of a 16-in. diameter grinding wheel. A concentric line pattern of finish is produced on the work.

A second new Arter rotary surface grinder, the Model F 12, is designed so that the wheelhead is slidably mounted on a vertical column. Both hand and automatic down feeds are provided.

Grinding is done by the periphery of a 14-in. diameter wheel. A concentric line finish is produced on the work.

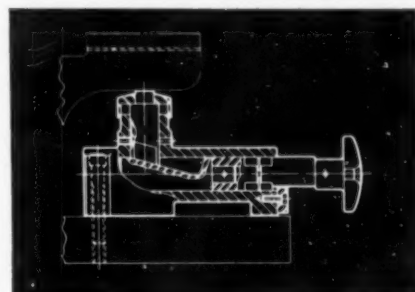
T-9-2053

Abrasive Machine Tool Co. has developed the 824 hydraulic feed surface grinder incorporating a ballway cross-feed plus accurate antibacklash cross-feed screw to permit grinding slots or shoulders to unusually close tolerances. The unit, designed for either production or toolroom use also incorporates features of the company's 1218 hydraulic. **T-9-2054**

A fully automatic machine for high-production flute or spline form grinding is announced by Gear Grinding Machine Co. Special features to achieve high quality and production include automatic loading of workpieces by either hopper feed or magazine loader, and a stock equalizer to automatically locate work relative to the grinding wheel for minimum stock removal. Rejection of defective workpieces also is automatic, as is trimming of the grinding wheel to assure uniformly accurate work. Automatic down feed control permits the operator to preset stock removal per stroke and total stock removal. By using multiwheel grinding, a number of teeth can be ground simultaneously, improving the production rate. Wheels are dressed by multiple fixed diamond trimmers to minimize

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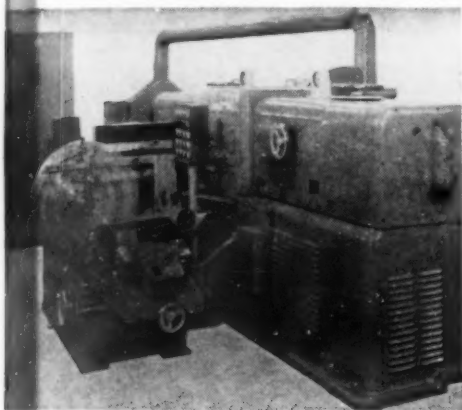
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INDICATE A-9-205

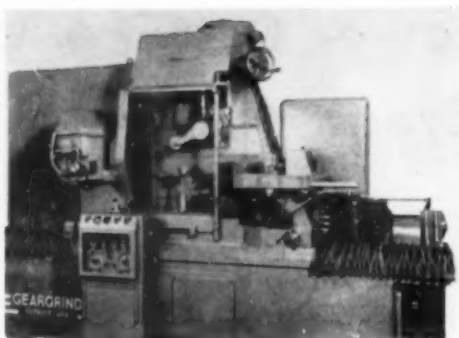


angement, setup for a variety of part sizes may be made quickly.

Control is entirely automatic even to pushbutton control for dressing each of two disks with separate dresses. Dresser arms are mounted individually for squareness with the head regardless of alignment. An improved design of Besly's sealed spindle quill is incorporated in the construction. Disk changing has been simplified so that time required for changing and setup has been cut to about one third.

T-9-2052

A new vertical column machine featuring a rectangular sliding table with a rotatable magnetic chuck is announced by Arter Grinding Machine Co. Built in two sizes, 12 and 16-in. chuck capacities, this unit, the Model E 16, can be arranged to grind work in a complete automatic cycle comprising



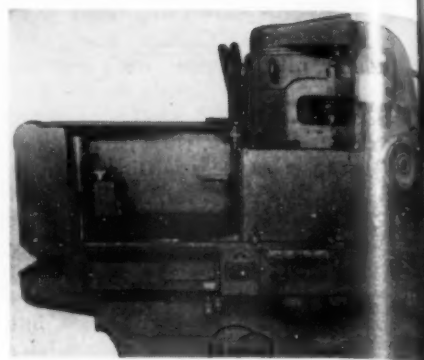
of the spline-form machine plus two other advantages. This gear-grinding machine for producing high-powered case-hardened gears employs single or double diamond trimmers to assure perfect blend between tooth profile and the root fillet. In addition, it has a controlled flow of cooling and lubricating fluid to the working area which, coupled with automatic feed, avoids surface tempering and checking.

T-9-2061

dressing time. When work cycle is completed, workpieces are automatically released. A clock device accumulates total machine cycle time for production control.

Another gear-grinding machine unit can also include the automatic features

The Blanchard Machine Co. is introducing the #18-C vertical spindle rotary table surface grinder which is a further development of the #18. The new unit incorporates an automatic cycle control to accomplish operations, including size control, ordinarily performed by the operator when running

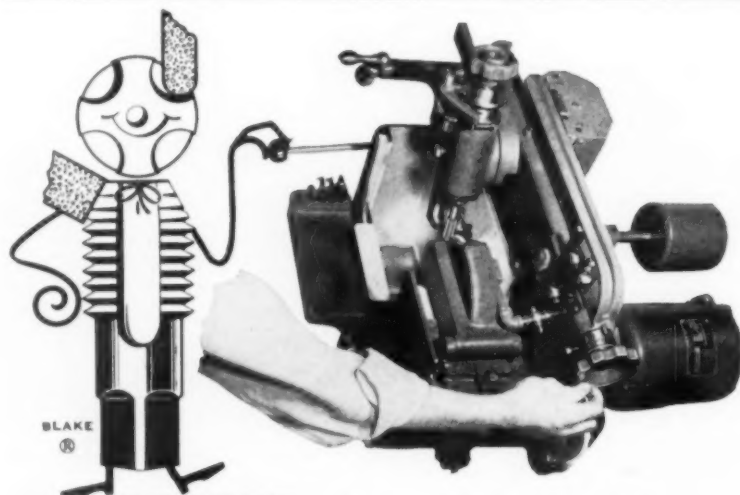


a standard #18 grinder. On suitable work, a tolerance of ± 0.0005 in. can be held in regular production.

An operator only loads the work on the magnetic chuck, after initial setup, and presses the "cycle start" button. The grinder completes the grinding cycle and returns the chuck to the loading position automatically

T-9-2062

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Get **BETTER** threaded holes, **MORE** threaded holes with Blake "Tapsaver" Grinders

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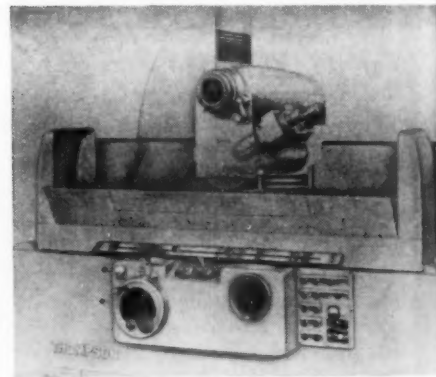
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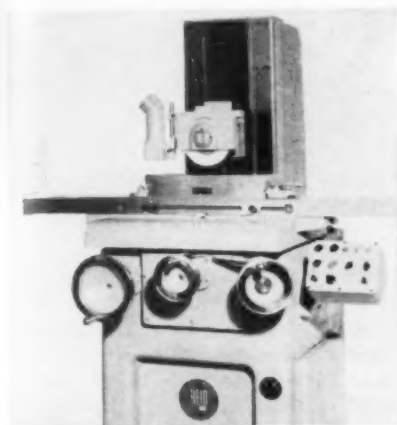
electric automatic wheel truing device mounted on the side of the wheel head having automatic feed and compensation. The entire unit moves by power elevation for rapid traverse, automatic increment down feed with coarse approach and fine feed for finish, as well as manual pick feed control.

The machine is built completely to hydraulic and electric JIC standards. All controls are centralized for operator protection.

T-9-2063

Reid Brothers Co., Inc. has announced a new line of Reid-O-Matic, Model 618-PF, 6 by 18-in. precision surface grinders.

These fully electric powered, push-button automatic grinders, for high-quality surface finishing, are designed



for simple finger-tip operational control from a convenient panel.

Dial controlled table speed is infinitely variable from 0 to 70 fpm. Table reversal is possible without reversing the driving motor. Cross-feed drive is dial controlled for infinitely fine adjustments from 0.001 to $\frac{7}{32}$ in.; a selector switch controls cross-feed at either or both ends of the table travel.

T-9-2071

Precision and uniformity are the main advantages offered by the new Gardner Machine Co.'s 2430-30-in. double-disk grinder for high-production grinding of parallel flat surfaces.

Features of the grinder include a new spindle design which increases



rigidity at the rim of the 30-in. disk by 500 percent. Stability is improved by new way design. A head zeroing indicator simplifies tilt and swivel setup for adjustment.

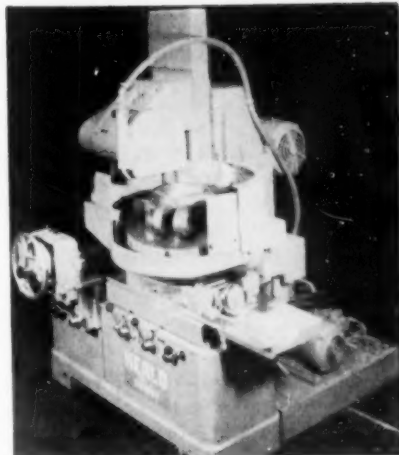
At work parallel-grinding pump gear blanks, production output is at a rate of 885 parts per hour.

Another Gardner unit, the 2V18 vertical double spindle grinder, is an economical, versatile tool for grinding a

variety of small parts. It will remove from 0.010 to 0.016 in. of stock at a production rate of 1200 parts per hour at required tolerances of 0.002 in. for flatness and parallelism, and 0.004 in. for uniformity. A manually operated grinder, it provides industry with a multipurpose double grinder for many types of small parts.

T-9-2072

Two new models of vertical column rotary surface grinding machines have been developed by The Heald Machine Co. Model 161 with 6-in. chuck and model 361 with 24-in. chuck are both constructed so that grinding pressure is directly over the ways to assure consistent accuracy in flatness as well as extremely fine surface finishes in regular production; 6-10 microinch, rms, is commonly attainable on suitable ma-



terials with finer readings readily obtainable.

The smaller unit, furnished with

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manual or mechanical type power table reciprocation, is suited to ordinary small surface grinding work as well as to finishing saws, slitters, gear cutters, etc. It has a 10-in. vertical capacity from top of chuck to center of grinding wheel, and the chuck can be swiveled 15 deg. for convex or concave grinding.

Similar in construction, the larger machine also has construction and power for big work or heavy stock removal. A double pump system on this hydraulic model assures little heat generation. It is furnished with plain or automatic cycles with a sparkout attachment available for the automatic machine. Swing inside the chuck

guard is 28 in. and vertical capacity is 17½ in. maximum from top of chuck to center of wheel. Convex swivel to 17 deg. and concave to 10 deg. is provided. **T-9-2081**

One or more diameters and an adjoining face or shoulder can be ground in one operation on the new Type K 10-in. plain cylindrical grinder with a 30-deg angle wheel head developed by Landis Tool Co.

The wheel head slides on precision V and flat ways which are permanently positioned at 30 deg from the normal perpendicular setting to permit the simultaneous dual grinding. Work



speeds range from 54 to 200 rpm.

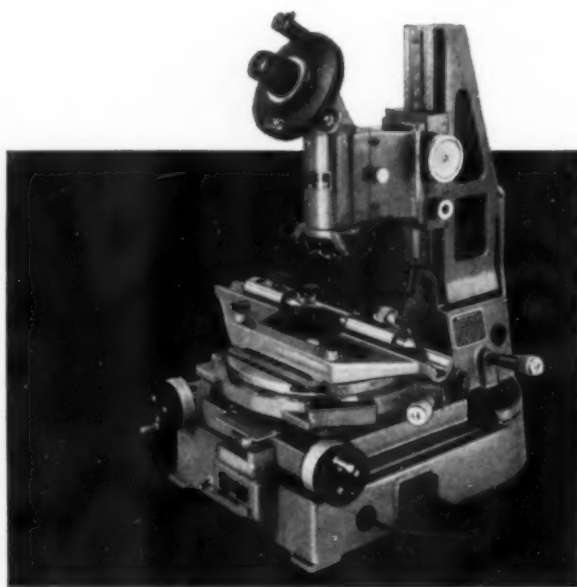
A hydraulic infeed mechanism provides automatic rapid positioning of the wheel head and a slow grinding-feed stroke which can be adjusted from 0 to 0.200 in. on diameter of work. A feed rate valve controls adjustment of the feed rate, and an antibacklash device assures extra close accuracy.

The hand feed mechanism for the wheel head includes a large diameter handwheel with a graduated dial reading in 0.001 in. Also provided is a fine feed dial of the dividing head type which reads in 0.0001 in.

The machine may include an overhead wheel contour dressing arrangement with profile bar, cam and cam follower.

A single control lever is provided for all operations, and lockout positions for maximum safety. All controls for the grinder are located at the front of the machine for operator convenience and visibility. A two-speed hand traverse mechanism is included, in addition to the hydraulically actuated traverse.

T-9-2082



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Angular Range 360°
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Protractor Range 360°
Reading to 1 minute

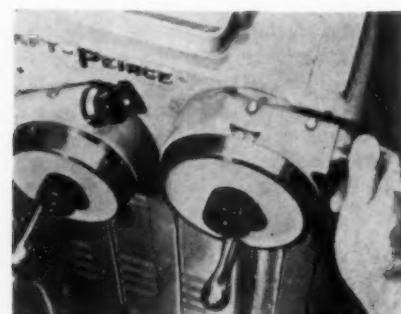
The Gaertner Scientific Corporation

1241 Wrightwood Avenue, Chicago 14, Ill.

WRITE FOR BULLETIN NO. 147-50

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Among equipment recently developed by The Taft-Peirce Mfg. Co. are vernier fine-feed attachments for vertical and cross-feed of a precision surface grinder. This attachment permits grinding to precision of 0.00005 in. A precision feed screw and nut prevents any tendency for the saddle to jump when sidewheel or form grinding to tenths or less. **T-9-2083**



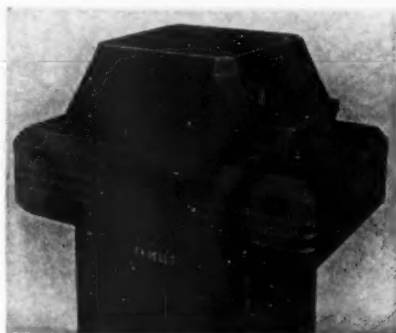
The Thompson Grinder Co. has introduced a 6 by 10 by 18 in. Type D hand feed surface grinder that offers sensitivity necessary to permit working to close tolerances with minimum effort. The unit is antifriction throughout including the table cross slide and elevation slideway bearings.

Cross feed is by movement of the wheel head mounted in the column. This entire unit has a cross travel of 6½ in. Vernier adjustments on both cross feed and elevation units permit accurate feeding of these movements within 0.0001 in. Large graduated dials are quickly and accurately reset to zero. Three-point leveling is provided for simplification.

Both horizontal and vertical spindles are available for this unit and they can be quickly changed for either type of grinding. **T-9-2091**

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Ex-Cell-O Corp. is introducing a new line of tool grinders made up of four models which range from precision units with 6-in. wheels to heavy-duty machines with 14-in. wheels. All are double-end models with reversible mo-



tors for proper wheel rotation for both left and right hand tools. Grinding is done on faces of plate-mounted wheels resulting in straight surfaces and accurate tool angles.

Tool rest tables, large enough to support tools firmly, are easily adjustable to required tool angles, and are also adjustable toward the grinding wheels to compensate for wear.

Any practical combination of grinding wheels can be used on these units; for example a diamond wheel at one end and a silicon carbide wheel at the other. **T-9-2092**

A universal cutter and tool grinder designed by Covell Mfg. Co. offers versatility to give time and money economy on setups because of the easy adjustment of the Pope tilting head. Swivel



and tilt clamps are quick acting. Operating controls are located both at front and rear of the unit for convenience.

This unit, called the No. 12-A, can be adapted to both cylindrical and internal grinding, and an attachment for wet grinding also is available.

T-9-2093

Work is ground directly from a drawing without either templates or masters with the Sheffield's Model 123 Micro-Form grinder for cylindrical work and circular form tools. This machine,

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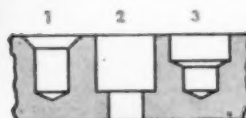
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Believing that there is too great a void between standard and special tooling, Mohawk has designed and developed a semi-standard subland tool.

The Mohawk Size-Optional Subland is machined, hardened and placed in a stock bin. This results in a material saving to the customer in set-up costs, reduces delivery time to a fraction of that usually required for special tools, and allows a tremendous reduction in inventory. In ordering these Size-Optional Sublands, the customer is limited only in relation to shank specifications, and partially on overall length requirements. Diameters and step lengths are completely optional to fit the particular application.

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- (3) Drill—Drill

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FROM RECEIPT OF ORDER



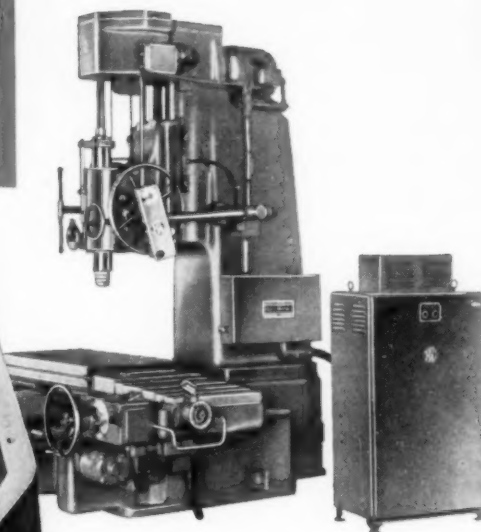
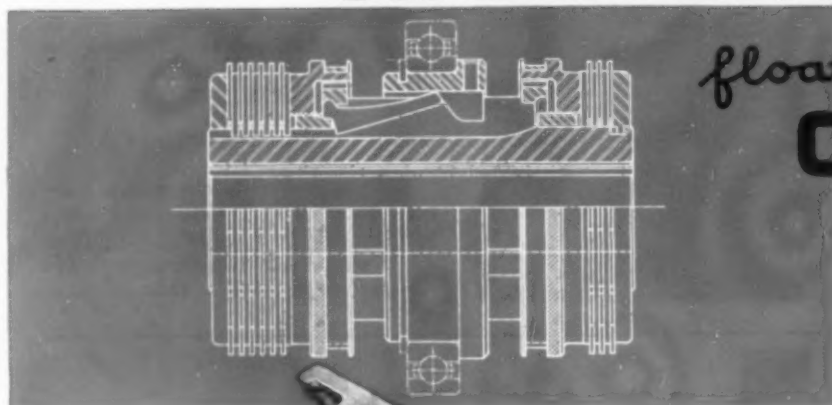
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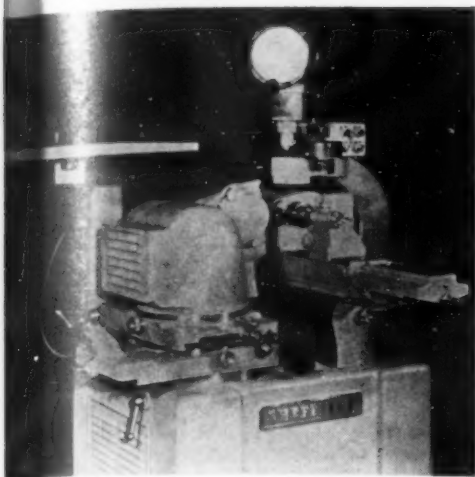
Here, in a nutshell, are the principal Maxitorq advantages . . . simple, rugged design and construction which practically eliminate maintenance . . . immediate, positive engagement . . . equally positive disengagement without drag or heating . . . almost unlimited adaptability to drive requirements . . . and the most compact units available for a given power transmission requirement. Write us, outlining your needs. We will be glad to give you our recommendations and complete technical data.

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External Grinders (Continued)



which features a heavy-duty dead center circular grinding unit integral with the upper table slide will perform work up to 8 in. diameter and 8 in. in length.

Production of precision-ground threads and forms on small parts, components and taps may be done with Sheffield's model 134 precision thread and form grinder. This small, compact unit with manually initiated automatic cycle can grind threads up to $\frac{1}{2}$ in. in diameter. Maximum capacity between centers is 4 in. It will grind up to 3-in. thread length at pitches from 120 to 20 tpi.

The grinding wheel can be formed by a Crushtree dressing device, or by a single-point or multiribbed diamond dresser. An automatic wheel dresser compensator is incorporated in the unit.

It also has a relieving attachment for tap production. An automatic multipass infeed device has from 1 to 5 adjustments within a depth range of 0.100 in. Maximum lead compensation is 0.003 in 3 in.

An outstanding machine developed by The Sheffield Corp. is its new model 180 multi-form grinder designed especially for the Crushtree dressing process. This machine, which uses a 4-in. wide wheel, will grind work up to 10 in. in diameter and accommodate a workpart 24 in. long. It is available with built-in size controls to bring parts automatically to finished size.

Features of the model include an automatic wheel-dressing device, variable speed control for automatic fast and slow feed on the wheel into the work, and an automatic plunge grinding device with 1-in. rapid approach and retraction of the wheel to the work. The wheel has cam-controlled feed of 0.250 in., with dwell time variable.

T-9-2111

A combination way and surface grinder has been developed by Mattison Machine Works for grinding large-bed castings, columns, tables, slides, saddles, etc., to precision tolerances without rehandling. The machine incorporates vertical and horizontal spindles in a single setup for grinding multiple surfaces while holding accurate relative alignment and fine accuracy at high production rates.

A second Mattison unit is the No. 72 4-spindle rotary automatic grinder. On this machine, parts are clamped and unclamped automatically as the fixtures rotate past actuating cams. The operator only loads and unloads the grinder. Wheel wear is automatically compensated for by sizing gages which maintain parts to manufacturing limits. Powered for high stock removal, self-dressing wheels are used to rough grind parts at high speed.

T-9-2112

An automatic cam contour grinding machine, the No. 3 Cam-O-Matic, has been designed by the Norton Co. for faster grinding of automotive camshafts with better finish. Simpler and sturdier construction are features of the unit as is the Gilmer timer belt for positive work drive without slippage.

T-9-2113

A hand-operated face mill grinder is being introduced by The Oliver Instrument Co. The machine, which will sharpen face mills 4 to 24 in. in diameter, is equipped with a cup wheel for



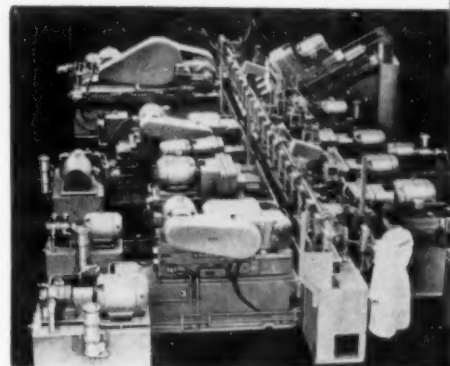
more efficient grinding of close-pitch face mills.

This heavy floor type machine is equipped with a face plate which will swivel 360 deg. The grinding wheel spindle can be tilted either side of center up to 90 deg. and locked in position. A diamond located beneath the grinding wheel provides a fixed grinding position and prevents error due to wheel wear.

T-9-2114

Transfer Machines

A Transformatic has been designed by The Cross Co. for machining main crankshaft bearing cap clusters. The unit has 19 stations: one for loading; 3 for milling; 8 for drilling, chamfering,



reaming and tapping, and 7 for visual inspection. An automatic transfer mechanism indexes parts from station to station. During operation 450 pieces per hour are produced at 100 percent efficiency.

T-9-2115

A transfer machine for automotive engine rocker arm shafts, featuring fully segmented automation, is introduced by Snyder Tool & Engineering. A series of 6 individual machines make up the 8-station, 53-ft long segmented unit. Each of the six have individual control panels and each are individually loaded with conveyor and hopper feeds. Because of the individualized features it is possible to keep up production output when certain areas of the machine are shut down for maintenance or tool change.

T-9-2116

Components & Attachments

A bar turner attachment for stepped shafts, the progressive step turner, has been developed by The Warner & Swasey Co. As many as five different diameters may be preselected and turned in a range from $\frac{1}{8}$ to $1\frac{1}{2}$ in. by this new attachment which utilizes a single cutter. Cutting length is limited only by the ram travel of the particular turret lathe.

It is suited to the shop which turns a wide variety of stepped shafts in small lots and thus requires fast flexible setup at low cost. The step turner also can be used as an easily set up single-cutter turner, which, when set to trip at the end of the cutting stroke, leaves no tool withdrawal marks on the workpiece.

A cutter holder incorporated in the

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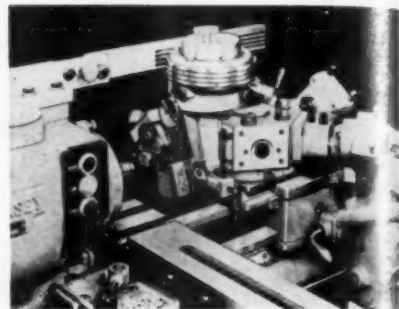
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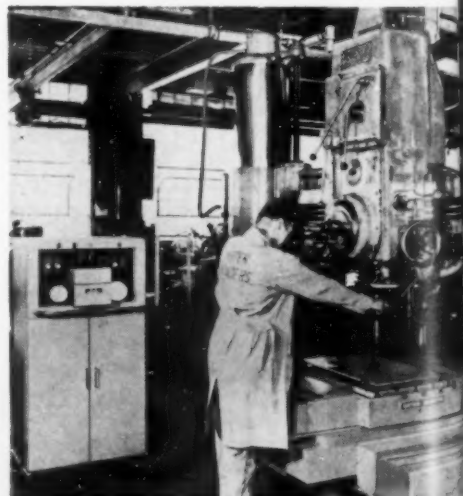


progressive step turner is mounted on a pendulum-like arm suspended from a large shaft. Movement of the arm is controlled by four simple preset micrometer dials located at the top of the attachment. When the first four diameters have been selected on the micrometer dials, the fifth diameter is obtained by means of a stop screw located at the end of the lower rack.

Once the pattern for various diameters has been established on the micrometer dials, the cutter can be adjusted to exact first cut size independently of the pattern. **T-9-2121**

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

A tape-controlled electronic digital positioning table that automatically positions a workpiece under or in front of a drill, tap, boring tool, etc., has been developed by Arter Grinding Machine Co. Movement of this unit, called the Jigmatic, is controlled entirely by the tape and there is no need for jigs, special measuring rods or screw rods. No layouts are necessary. Work setup is simple and fast. Only limiting factor on number of holes that can be drilled in work on a given size table is the length of tape that the reels can handle. Tape is punched directly from engi-



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A-9-250	Barnes Drill Co.	Honing Tools and Abrasives—Catalog 500A discusses the complete line of Barnes' products. (Page 250)
A-9-389	Bay State Abrasive Products Co.	Diamond Wheels—Latest diamond wheel handbook includes net prices and all bonds: Vitrified, Metal, Resinoid. (Pages 388-389)
A-9-339	The Bellows Co.	4-way Valves—Bulletin AV-300R discusses air design problems which can be solved with 4-way valves. (Page 339)
A-9-342-3	Black Diamond Saw & Machine Works	Drill Grinders—All facts concerning Black Diamond Drill Grinders are contained in illustrated 4-page bulletin. (Page 342)
A-9-357	Boston Gear Works	Speed Reducers—Catalog R-56 gives specifications and selection data for reducers, ratiomotors and flanged reducers. (Page 357)
A-9-374-3	Chicago Dial Indicator Co.	Dial Indicators—Sixteen-page illustrated catalog 106 discusses the Geneva dial indicators and precision production. (Page 374)
A-9-42	The Cleveland Crane and Engineering Co.	Presses—Catalog 2010 gives construction and engineering details and is illustrated. (Page 42)
A-9-323	Consolidated Machine Tool Corp.	Collapsible Taps—A new Bulletin M-113 gives full information on modern MC Collapsible Taps. (Page 323)
A-9-346-3	Detroit Stamping Co.	Portable Clamps—De-Sta-Co clamps are discussed in bulletin 482-4-6. (Page 346)
A-9-295	De Vlieg Microbore Co.	Boring and Milling Equipment—A new, complete manual of applying data is available on request. (Page 295)
A-9-337	Eastman Kodak Co.	Contour Projectors—"Kodak Contour Projectors" gives details about optical gaging and how it can solve problems. (Page 337)
A-9-208	The Gaertner Scientific Corp.	Toolmakers' Microscope—Bulletin No. 147-50 gives complete specifications for Gaertner microscopes. (Page 208)
A-9-252	Giddings & Lewis Machine Tool Co. Davis Boring Tool Div.	Boring Equipment—Catalog 304 describes the complete tool line of Davis products. (Page 252)
A-9-69	Gisholt Machine Co.	Superfinishers—Complete and authoritative textbook on superfinishes is available on request. (Page 69)
A-9-340	George Gorton Machine Co.	Milling Machines—General Catalog 1655-2609 describes the complete line of Gorton machines. (Page 340)
A-9-239	Handy & Harman	Brazing Alloys—Words and pictures in Bulletin 20 describe Easy-Flo, silver brazing alloys and include useful pointers on joint design and time-labor-cost-saving brazing production methods. (Page 239)
A-9-260	Hannifin Corp.	Hydraulic and Air Cylinders—Bulletin 113, Series "H" discusses hydraulic cylinders; Bulletin 213, Series "A" discusses air power cylinders. (Page 260)
A-9-312-2	John Hassall, Inc.	Cold-Heading Equipment—Catalog discussing Hassall products is accompanied by Hassall wall chart. (Page 312)
A-9-194-1	Hydro-Line Mfg. Co.	Hydro Cylinders—Bulletin 53 discusses Series "J" cylinders. (Page 194)
A-9-80	The Ingersoll Milling Machine Co.	Milling Cutters—Catalog 66F describes Ingersoll inserted blade face mills, end mills, helical slab mills, side mills, arbor cutters, angular cutters, and boring heads. (Page 80)
A-9-264	The B. Jahn Mfg. Co.	Progressive Dies—"Story of B. Jahn Dies" is available on request. (Page 264)
A-9-242	Jarvis Corp.	Power Tools—Among the materials discussed in catalogs are taps, rotary files, tungsten carbide reamers, tungsten carbide end mills, and torquomatic tapping attachments. (Page 242)

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A-9-298	Keller Tool Div. of Gardner-Denver	Multiple Spindles—Advantages of Keller multiple spindles are discussed in Bulletin 16-101. (Page 298)
A-9-203	Kling Bros. Engineering Works	Friction Saws and Guillotine Shears—Bulletin 100 illustrates and describes complete Kling line of metalworking machines. (Page 203)
A-9-192	Lapeer Mfg. Co.	Air-Operated Clamps—Catalog describes the various models and types of clamps. (Page 192)
A-9-332	Lepel High Frequency Laboratories, Inc.	High-Frequency Induction Heating Units—Thirty-six illustrated page catalog contains information on high-frequency induction heating. (Page 332)
A-9-374-2	Louis Levin & Son, Inc.	Micro-Drill Press—Catalog M describes the micro-drill press, full range of collet sizes, drills, accessories and other precision tools. (Page 374)
A-9-61	Lipe-Rollway Corp.	Stock Feeds—Twenty-four-page illustrated booklet, "The Important 4th Dimension of Production and Profit" is available on request. (Pages 60-61)
A-9-334-2	Lovejoy Tool Co., Inc.	Milling Cutters—Three new Lovejoy catalogs: arbors, face mills, side mills and speed and feed calculators available on request. (Page 334)
A-9-384-3	W. F. Meyers Co., Inc.	Carbide Inserted Drill Bushings—Information and prices for Meyco drill bushings are contained in catalog 42. (Page 384)
A-9-304	Nelco Tool Co., Inc.	Milling Cutters—Over 850 standard cost-cutting, time-cutting cutters are described in new catalog. (Page 304)
A-9-376	Nice Ball Bearing Co.	Ball Bearings—Catalog 150 describes the complete line of Nice bearings. (Page 376)
A-9-44	C. A. Norgren Co.	Air Line Lubricators—Catalog shows latest developments in Micro-Fog lubrication and gives data on Norgren's complete line of lubricators, air filters, pressure regulators, valves and hose assemblies. (Page 44)
A-9-255	Oakite Products, Inc.	Steel Cleaning Equipment—Three booklets containing information about electro cleaning of steel, brass or zinc high castings are available upon request. (Page 255)
A-9-355	The Ohio Crankshaft Co.	Induction Heating Equipment—Free Tocco induction heating catalog available on request. (Page 355)
A-9-377	The Ohio Knife Co.	Bed and crossways—Ohio Knife bulletin shows 7 standard cross sections in over 60 sizes. (Page 377)
A-9-246-2	Pioneer Engineering & Mfg. Co., Inc.	Engineering Services—Bulletin PE-25 describes the advantages of Pioneer Engineering Services. (Page 246)
A-9-314	Pioneer Tool Engineering, Inc.	Vacuum Chuck—Catalog 921-T gives complete range of applications, important mechanical properties, stock sizes and special cast sizes. (Page 314)
A-9-11	Pope Machinery Corp.	Boring Machines—Bulletin S-9 shows advantages of the new Pope hole boring machine. (Page 11)
A-9-385	Reid Brothers Company, Inc.	Surface Grinders—Reid-O-Matic grinders are discussed in Bulletin PF-15. (Page 385)
A-9-362	Robinson Aviation, Inc.	Machinery Mountings—Bulletin 850, "Robinson Vibration and Shock Mounts for Industry," and "Trends" sheets W100 and W101 give engineering information on the mounts. (Page 362)
A-9-189	The S-P Mfg. Corp.	Power Chucks—Catalog 105 describes the advantages of S-P power chucks. (Page 189)
A-9-14	U.S. Tool Co., Inc.	Special Machine—Bulletin 15-T contains specifications for the U.S. Multi-Slide machine. (Page 14)
A-9-359	Wales-Strippit Corp.	Special Machine—Colored, illustrated catalog 10-AA describes punching, notching and nibbling operations performed on W-S machine. (Page 359)
A-9-262-1	Willey's Carbide Tool Co.	Tungsten Carbide Tools—A variety of Willey's carbide tools is discussed in three new catalogs. (Page 262)

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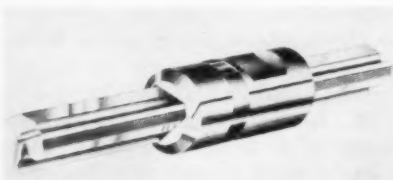
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feeding drawings, then is inserted in the reader of the console which may be located wherever convenient, then a pushbutton actuates its control of operations. **T-9-2151**

An adjustable press control arm, providing a flexible method of positioning the "run" and "stop" buttons on presses for greatest operator convenience and safety, has been designed by Danly Machine Specialties, Inc. Control buttons are mounted on a bar attached to an adjustable telescoping arm which permits location at any desired height. Although permanently mounted to the press, the arm may be swung clear of the work area when changing dies and immediately relocated when production is resumed. **T-9-2152**

Operations for which two-flute and three-flute end mills are normally used may now be performed by the unusually designed end mills developed by Illinois Tool Works. Shape of the new Illinite_R Tri-Mil end mills is responsible for their performance advantages; in addition to being easy to sharpen, they provide extra long tool life.

From an end view, the three cutting edges of the Tri-Mil form the points of an equilateral triangle, and the cutting edges run the full length of the tool. Because there is no shank, the new end



mills are held by three-side collets, making it possible to lock the end mill closer to the work, and thus providing greater rigidity. As the end of the mill becomes smaller than size required, due to resharpening, the worn end can be ground off and new end teeth ground in.

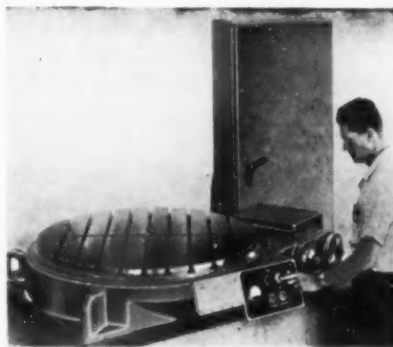
The shape of the mills leads to easy resharpening on a surface grinder, and several can be sharpened simultaneously. Because the three cutting edges form an equilateral triangle, concentricity of the outside diameter is assured after sharpening. **T-9-2153**

An automation switch, a mechanical rotating limiting device for electrical control of stopping, starting, interlocking, motion, time, sequence and recy-
cling of press accessory equipment

has been developed by E. W. Bliss Co. It can control 9 separate circuits during high-speed production, giving independent and infinite adjustment of each circuit without stopping the press.

Adjustments from 0 to 360 deg of every control switch in the device are possible; accuracy is within 1 deg. **T-9-2154**

Quill type hydraulic power units to provide automatic cycles for production machines as well as for feeding and rotating cutting tools or driving multiple spindle heads are announced



by Ex-Cell-O Corp. Especially suitable for automatic drilling, reaming, counterboring and spot facing, these new models incorporate step-drilling equipment. These versatile power units permit easy arranging of machining cycles and provide a wide range of feed rates. Several units may be used on a single base for multiple operations. Controls can be set for simultaneous or successive operations. **T-9-2155**

The Compudex, introduced by Kearney & Trecker Corp., can be mounted on most dividing heads and rotary tables for use in a broad variety of accurate indexing applications. It can index by degrees to as low as 10 min of arc, will divide a circle into any number of equal parts from 1 through 1099, and will index all even numbers through 2198.

It is quick and easy to operate, requiring only four simple steps when a job is set up, plus two on each new index. No index plates, followers, gear charts, hole log sheets or loose parts are required. **T-9-2156**

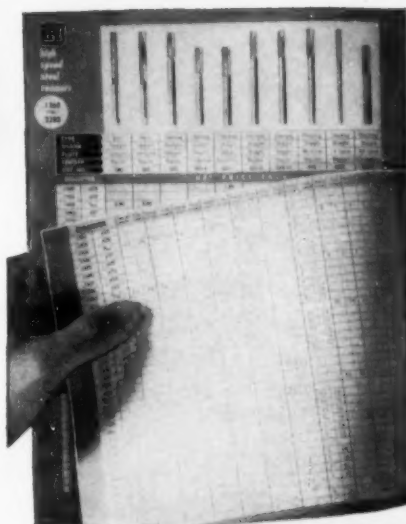
Addition to its line of a 24-in. plain optical rotary table that incorporates an easily read, projection optical system for unusually accurate circular spacing and angular positioning is announced by Pratt & Whitney. The optical measuring system uses a graduated glass master disk to subdivide 5-

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min. divisions into 300 equal parts for direct settings to 1 sec. of arc. Readings are magnified and projected on a viewing screen. Feature of this table is its full 360-deg adjustment of the optical zero.

Another addition in the P & W line of rotary tables is the 48-in. precision vertical unit designed particularly for inspecting large heavy workpieces.

Table dial graduations read direct to 1 min. of arc, vernier graduations read direct to 2 sec. The unit also will provide precise work location on heavy equipment for various machining operations. **T-9-2161**

Cylinders for use with up to 150-psi air or 500-psi oil have been announced by Logansport Machine Co., Inc. with

the introduction of its Logansquare line. Eight bore sizes are available, ranging from 1½ to 8 in. They feature steel covers, cup packing-type piston assembly, brass cylinder tube, rod wiper, V cup rod packing, bronze rod bushing and tie-rod connections. They may be furnished with or without cushioning. **T-9-2162**

Automatic programming has been made available for circular spacing, inspecting, calibrating and machining with the introduction of the 42-in. precision rotary table by Pratt & Whitney. The new unit is similar in mechanical design to the earlier 42-in. plain rotary table.

Spacing is accurate to seconds of arc. Indexing dogs can be placed as close

as 3 deg. Once index points have been established, the operator only presses the "cycle start" button and the table automatically indexes from one point to the next. Each point is located by the dogs electromagnetically without making physical contact.

Four speeds are introduced automatically as part of the indexing cycle. A cycle for a 30-deg arc is completed in approximately 6 sec. **T-9-2163**

Two new drive units have been developed by Sheldon Machine Co., Inc. for its lathes. A U-type drive for the UM-56-P pedestal mounted lathe provides external shifting levers for 8 rapid spindle-speed changes. Now, with an increased range of 50 to 1200 rpm, this all V-belt drive permits quick shifting to preselected spindle speeds. The second innovation is a lever-operated variable-speed drive. **T-9-2164**

A control unit, to be used on a jig borer, accepts numerical information from punched tape or cards and positions the machine automatically to 0.0001-in. accuracy. Developed by Pratt & Whitney, Div. of Niles-Bement-Pond Co., the numerically-controlled jig borer control automatically translates the punched instructions to position or repositions.

As applied to a jig borer, the control makes setting and resetting fast, simple and certain. Maximum time required to simultaneously set the table longitudinally and the carriage transversely is 15 seconds. **T-9-2165**

W. B. Knight Machinery Co. has designed a 42-in. power-feed rotary table to adapt a vertical or horizontal milling machine for power circular milling or indexing. Entirely self-contained with motor drive, there is no feed connection to the milling machine. Setup time is negligible. Table is equipped for infinitely variable feed. With the use of subplates, table diameter can be increased to 60 in. **T-9-2166**

Presses

To speed operation, avoid hazards and improve production efficiency, Danly Machine Specialties, Inc., has designed an Autofeed press with all controls, the automatic feed device and the scrap cutter an integral part of the unit. As soon as the press is set into position, it is ready for immediate operation without additional control panels or auxiliary equipment installations.

Control panels, located in the press

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- Screw Feed Tables make table adjustment easy and protect against wheel damage.

For those who prefer to grind dry, the Model D-6 Dry is available. The trend, however, is to the Wet Model WD-6 with which the dust problem is eliminated and the advantages of wet grinding enjoyed — and at the nominal price of \$395, complete as shown less wheels.

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T-9-2166

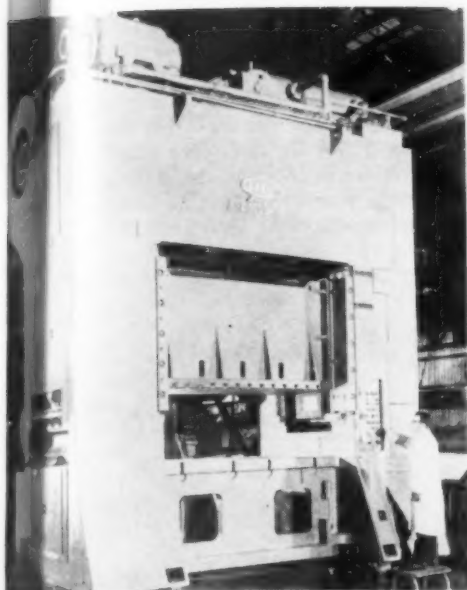
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uprights, are protected against damage. The integral, automatic feed device and scrap cutter simplify material handling and keep the floor area around the press clear. Hinged doors and panels provide quick access to all accessories for periodic servicing. **T-9-2171**

L & J Press Corp. has introduced a 20-ton capacity, double-crank, straight side press that has a maximum speed of 450 spm. This model No. 20-2-24 may be run with a progressive die for large volume production of small precision parts. Equipment includes air clutch with controls for inching, single stroke and continuous running; adjustable rotary limit switch; air release spring set brake; and pushbutton speed controls. There are thermal limit switches in all crankshaft bearings. A microswitch in the die is interlocked with clutch control.

A second press introduced by L & J is the No. 5 O.B.I. unit of 56-ton capacity. Available in both geared and nongear models, it is designed to provide more rigidity in stress areas to minimize deflection under heavy loads.

T-9-2172

Main feature of the unusual, Clearomatic draw press, developed by Clearing Machine Corp., is the press clutch that provides a mechanical means of changing speed of rotation of the drive shaft while the press is cycling. In practice, the press operates at low speed during the working stroke, and at high speed during the return stroke and the approach. As a consequence, productive speed of the press is about twice that of conventional equipment. The clutch can be adapted to many types of single and double-action

presses with either underdrive or overdrive.

Another press announced by Clearing is the model F single-action straight side press with eccentric gear drive and guided plunger. Features include the Clearing hydraulic safety overload protection. Completely contained within the slide, the safety device provides a hydraulic cushion under the adjustment units. Should there be an accidental overload beyond a preset tonnage, the hydraulic units will give way before damage can occur. **T-9-2173**

The Model 180-10 press brake, manufactured by Hamilton Div. of The Lodge & Shipley Co., incorporates a wedge type ram pressure release for quick and easy release of ram pres-

sure in event of stalling. Other features of the unit's design are motor-operated micrometer ram adjustment with direct-reading indicators to show vertical adjustments in 0.001 in., air clutch and brake to assure smooth operation with minimized maintenance. Capacity of the brake is 10 ft by 9/16 in. **T-9-2174**

Two new press brakes in The Cincinnati Shaper Co. line include the 2-30 series, with a capacity of 30 tons that will bend 6 ft of 14 ga mild steel, and the 3-50 series with a capacity of 50 tons and 6 ft of 10 ga mild steel. Both series include among their features: front controlled variable-speed drive from 20 to 50 spm; micrometer ram adjustment indicators at both ends

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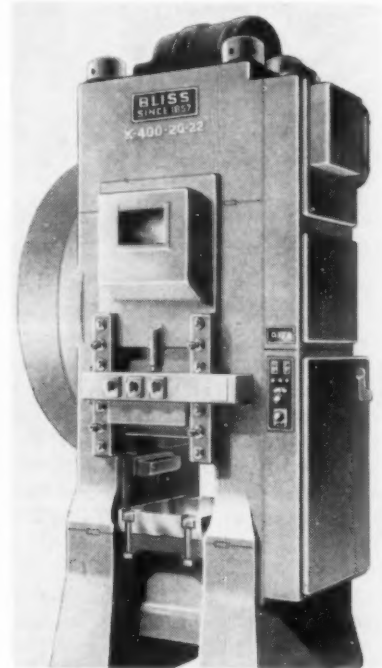
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of the ram for accurate settings; swivel end guide bearing for endwise adjustment; adjustment for tilting the ram quickly for fadeout work; 12-in. die space for interchangeability of dies with larger machines.

A 900-ton press brake by Cincinnati Shaper has a bending capacity of 1 in. by 12 ft mild steel. It has a 6-in. stroke, 14-in. throat, 16-in. shut height and 16-in. wide bed, 2-speed mechanism, air counterbalances, micrometer indicators on ram and automatic locking of ram adjustment. **T-9-2181**

A completely automatic turret punch press for which an operator only loads material and unloads finished work is being introduced by Wiedemann Machine Co. Press and work locating tables are controlled by a tape-fed programming unit to automatically perform all functions including simultaneous positioning of work under the punch, selecting turret station carrying the proper punch and die, tripping the press, and automatically repeating the operations until all holes are accurately located and punched. **T-9-2182**

Four new lines of presses are introduced by E. W. Bliss Co., designed to meet the trend of automatic production and need for decreased maintenance requirements. A 75-ton O.B.I. incorporating a new air clutch has a totally enclosed frame design and box type crown for extra rigidity. Its features include a motorized inclining mechanism,



nism, which permits inclination up to 20 deg without a pit. Slide adjustments, which also can be motorized, speed die settings. An automatic rotary limit switch, return oil system and the Bliss new Type-M clutch which is a combination clutch and brake mounted on the crankshaft, are other design points. Sizes run from 75 to 200 tons.

A knuckle joint press designed by Bliss is a 400-ton unit designed especially for work needing powerful pressure close to bottom stroke. Design improvements include a motorized wedge type slide adjustment which needs no top lock device or compression spring because it is self-locking at any point of adjustment. Air counterbalances on reciprocating parts assure smooth operation. Two independent, motor-driven lubricating systems, one for lubrication to the knuckle link system, one for other press bearings, are interlocked against pressure failure.

A high-production press capable of speeds over 450 spm offers several design features. All controls are mounted in a movable pulpit-like pedestal for operator convenience plus protection from dirt and damage. Oil reservoirs, filters and pump are located in a leg of the press.

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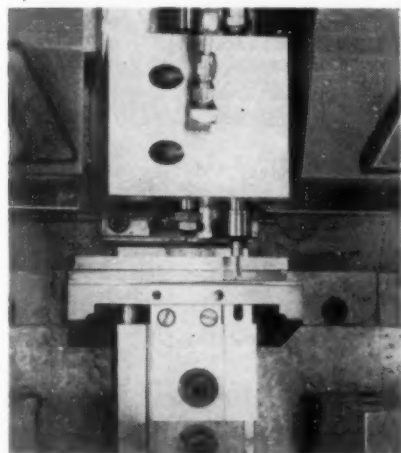
A 150-ton pipeless hydraulic metalworking press is designed by Elmes Engineering Div. of American Steel Foundries for complete freedom from main circuit high-pressure piping trouble. High-pressure fluid in the main circuits of this press is conducted through short direct passages drilled in the structural parts. It is impossible for oil to drip from loose fittings.

T-9-2191

A high-production, deep-draw press is announced by Steelweld Machinery Div. of The Cleveland Crane & Engineering Co. Rated at 215 ton with a height of 16 ft 8 in. above the floor, its design incorporates a linkage that provides quick approach, quick return, and slow constant velocity through the drawing range. By utilizing high speed during nonproductive portions and correct drawing speeds during the working portion, the unit operates up to 80 percent faster in strokes per minute than single-speed units providing the same drawing speed.

T-9-2192

U. S. Tool Co., Inc. has equipped its multi-slide machine with a set of tools and tapping attachment which will produce in one operation a com-



plete formed metal stamping including piercing, extruding and tapping of a 6-32 hole.

The machine on which this unusual tooling is arranged is designed and built for automatic high-speed production of precision formed stampings from coil stock. The new setup eliminated necessity for another secondary operation and increases versatility of the tool.

T-9-2193

A 200-ton O.B.I. press with counter-balanced box type ram is announced by Ferracute Machine Co. Among features of this model CG 37½ is an air-

powered, electrically controlled friction clutch with interconnected brake and single-point adjustment. This design offers quick, accurate control for punch presses requiring start-stop operations. Built to conform to JIC press standards, the unit will accommodate any type automatic or semiautomatic feed attachments.

T-9-2194

Planers

A planer that will operate at speeds from 0 to 300 fpm and faster without sacrificing power necessary for extra heavy roughing cuts, is announced by Rockford Machine Tool Co. Power of this tool ranges up to 14 tons of cutting force. Cutting force is proportionately increased as table speed is decreased. The unit operates by finger-tip pendant control.

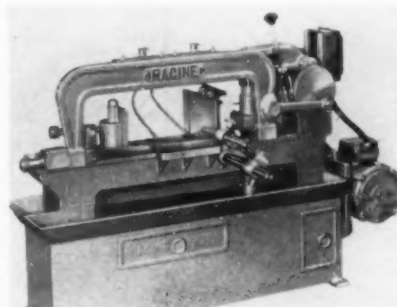
T-9-2195

A 72 by 72 in. by 24 ft, 10-in. quill planer-miller is announced by Giddings & Lewis Machine Tool Co. Designed for high-speed production milling, it has 4 heads, each provided with 24 spindle speeds ranging from 9 to 500 rpm. Control of all functions is from 5 pushbuttons and a single feed selector dial. Auxiliary functions are controlled from a permanent panel at the right of the machine; operating functions are controlled from a portable pendant station. A "feed reel" system encloses all electrical, hydraulic and coolant facilities, and prevents the collection of various hoses, cables and wires around the headstock.

T-9-2196

Saws

Racine Hydraulics & Machinery Inc. has developed a hydraulic utility saw which combines a large 8 by 16-in. capacity with broad utility. It will handle a full range of general cutoff work from

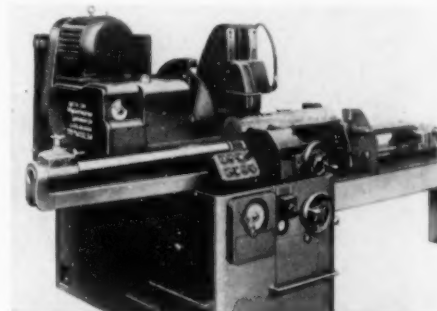


tool steels and dies to mild bars, tubing and structural shapes. The saw, model #816, is available with a 2-speed or 4-speed drive. A limit switch is used instead of a clutch to result in an effi-

cient drive without gears, levers or ratchet devices. When a cut is completed, the motor stops and the saw frame automatically rises to its highest point.

T-9-2197

Latest improvements and innovations for cutting machinable metals are incorporated in the design of the No. 2-8-A circular sawing machine introduced by Motch & Merryweather Machinery Co. It will cut all solid and structural shaped metal, with capacity up to 8 in. round or square. Gear changes providing 6 spindle speeds are



made by a dial in the saw head. All control mechanisms are grouped at the front of the machine.

New to this type equipment is the drive by enveloping worm to helical pinion and spindle gear with special backlash take-up. It minimizes tool backlash and also provides accurate, rigid and fast cutting.

Latest in the line of Motch & Merryweather blade sharpeners is the G-45 to sharpen blades from 8 through 45 in. in diameter. Feature of the tool is its ability to grind alternating high and low teeth. The high tooth is chamfered on either side and the low tooth is square. The narrow tooth roughs out the center and the wide tooth finishes the cut. Grinding contour is automatically produced by cam action with index plates controlling the tooth spacing. It will grind varying diameters, thicknesses, rake angles and pitches.

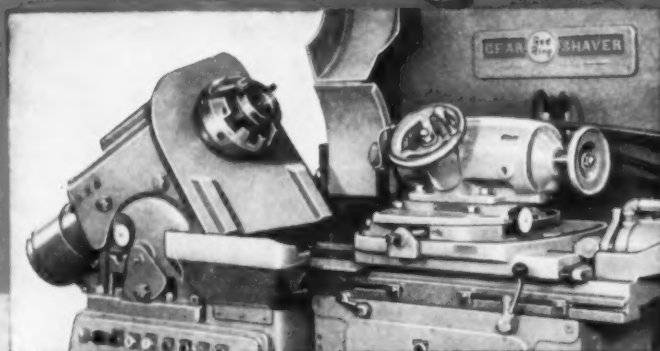
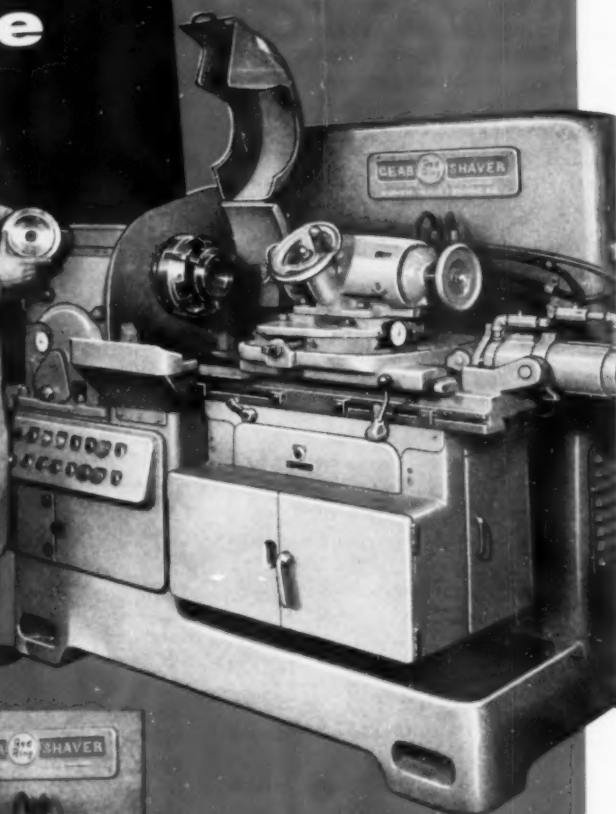
T-9-2198

Honing & Lapping

An automatic unit, the Model 836-2 Microflat developed by Micromatic Hone Corp., offers a new method of processing pinion gears to give longer life, quieter operation with increased production and less scrap. Paral-Flat operation generates parallel and flat end faces on the gear to provide control surfaces for subsequent processing. Production is at a rate of 1200 gear blanks per hour. Automatic loading; feed-back to compensate for abrasive

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- It assures precision comparable to that established by Red Ring Machines for external gears.
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When using the automatic feed cycle a selected number of cutting strokes, each with its own selected increment of up-feed, can be combined with whatever idling strokes are desired. At the end of the cycle the machine automatically stops in the proper backlash position for rapid unloading.

If your manufacturing program includes internal gears, write for complete information on this new shaving machine.

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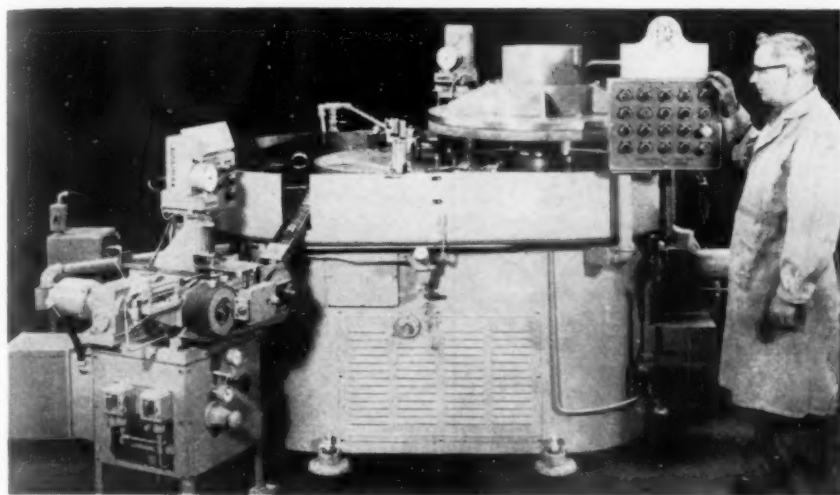
Honing & Lapping

(Continued)

wear, controlled by an air gage that checks thickness of each part, plus automatic ejection and gaging for parallelism are features of this completely automated unit. Both abrasives are dressed simultaneously without dismantling the machine.

A second unit (illustrated) Model 738-C Michrohoner, hones the bore of

gear blanks, from the previous unit, round, straight, to size and square with parallel faces at a rate of 120 parts per hour. About 0.004 in. of stock is removed from each diameter. Size is held to less than 0.0003 in. tolerance, and taper and out-of-roundness to less than 0.0001 in. Production is completely automatic from feeding of blanks into the machine, their location and clamping. Microsize control to assure final size, and checking by an automatic air gage. **T-9-2211**



High-production precision honing of 3-in. lengths is accomplished with the new Model 111 honing machine developed by Barnes Drill Co. Features of the unit are the air-electric hone expansion, Plugmatic bore-to-bore sizing, automatic loading, and gaging equipment for checking and ejecting honed parts. **T-9-2212**

A machine for either single or parallel face flat lapping that can be arranged for a plain, timed cycle, automatic continuous feed or semiautomatic continuous feed, is announced by Norton Co. Bonded abrasive wheel laps are used in conjunction with filtered coolant to provide rapid lapping action with increased output of finished parts ready for use without expensive washing operations. Optical flats may be used for inspection because of the bright surfaces produced. This unit, called the No. 48 Hydrolap, offers features that permit a greater range of workpiece sizes to be handled at a faster rate with less operator attention than has been possible with previous units. **T-9-2213**

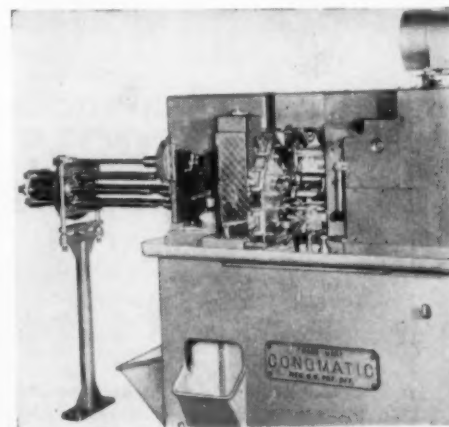
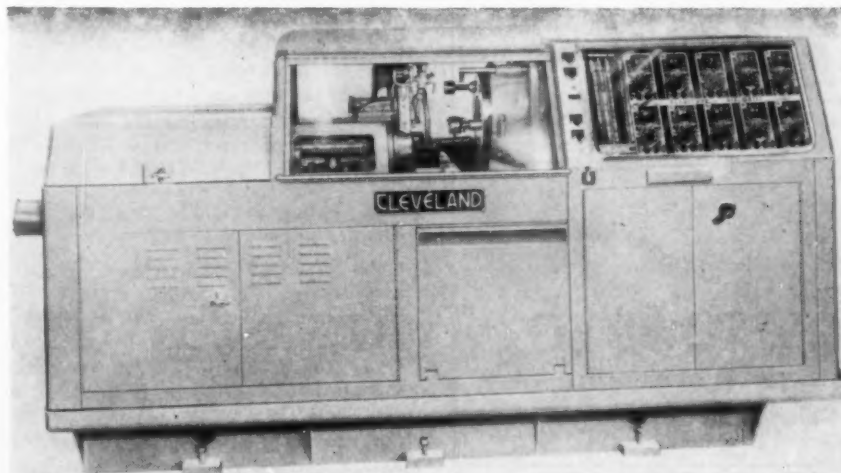
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Automatics

A 1 $\frac{3}{8}$ -in. single-spindle automatic is being announced by The Cleveland Automatic Machine Co. This Model AB Dialmatic is equipped with a special electric feed drive to provide separate infinitely adjustable feeds both forward and return for each of the tool's five turret positions. Feed adjustment of the turret tools does not involve any cam changes. Spindle speeds are infinitely variable from 40 to 3200 rpm. Speeds are preselected for

each turret tool simply by properly setting dials and switches on the control panel. A chart on the control panel allows quick computation of proper setting that will provide desired speed and feed. As a further feature, feed rates can be changed while the tool is cutting to gain maximum production. There are 10 automatic speed changes for each cycle of the machine.

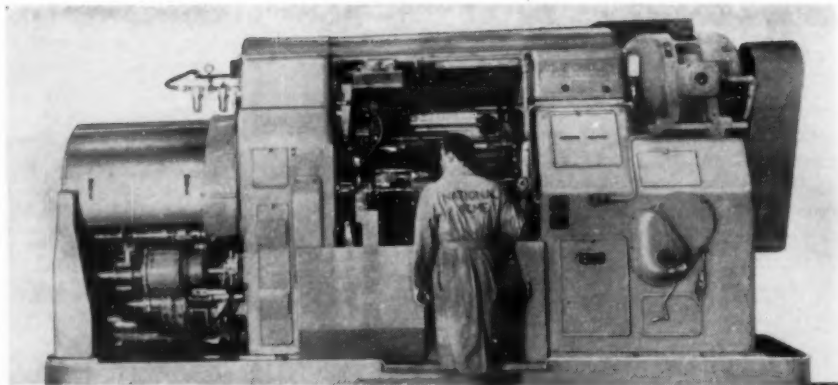
This Dialmatic also is available in a 1 $\frac{5}{8}$ in. model. **T-9-2214**



field. The smallest size machine built by Cone, it will make a valve seat screw of $\frac{3}{8}$ in. hex brass.

Another machine in the new line is the 4-Hi Conomatic. This 1-in. size machine will form, chamfer and cut off studs simultaneously from 4 bars of $\frac{7}{8}$ -in. C1144 held in the four work spindles. A pickoff attachment holds the pieces for clean cutoff operations by the four cutoff blades. **T-9-2215**

The National Acme Co. is introducing a giant-capacity production 8-spindle bar automatic (right). This 4-in. Acme-Gridley unit uses carbide tooling throughout. In operation to produce bearing races, for example, the machine turns out 340 pieces per hour. Two at a time are made from 52100 steel tubing in a machine cycle time of 21 seconds. **T-9-2221**



A 12-station, 28-spindle automatic indexing machine, with a 100-in. diameter base and 12 rotating work-holding fix-

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tures, is manufactured by Kingsbury Machine Tool Corp. It will work on 4 faces from the vertical. The table indexes 30 deg for one complete revolution while holding fixtures rotate 90 deg clockwise at each index of the table. **T-9-2222**

A 1-in., 6-spindle automatic bar machine, tooled for a part requiring drilling, reaming, lead-screw tapping, forming, recessing, shaving, stenciling and thread rolling, is introduced by Greenlee Bros. & Co. Bars are fed with an air-feed arrangement. Ball bearing spindles provide high speed. **T-9-2223**

Shears

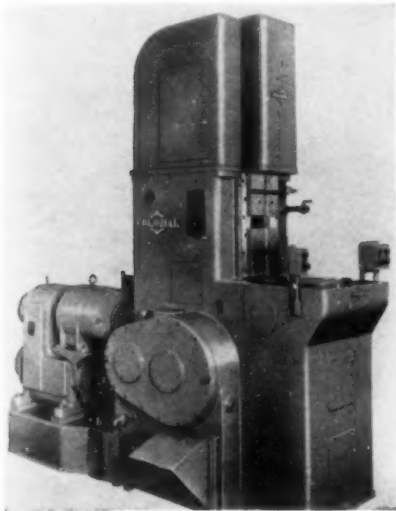
Lodge & Shipley Co.'s new Model 0610 power squaring shear has inclined-blade cutting, air counterbalances, automatic lubrication, back gage and indicator. Although it incorporates the company's new Hydro Hold hold-down system, it can use a still newer system featuring "no mar" operation in which hold-down impact damage and noise are avoided. Using an air/oil/electric system, the hold-down fingers are brought down gently on material, then extreme holding power is developed before the blade cuts. **T-9-2224**

Wysong and Miles Co. has announced an 11-ton squaring shear with a 10-ft cutting length and capacity up to 1/4-in. mild steel. Among new standard features of the unit are its automatic lubrication system; ball bearing back gage and air-trip operated clutch. **T-9-2225**

A 5 1/4 ton automatic shear for high production at close tolerances is announced by Wysong and Miles Co. Features of the shears include air clutch, air brake, air trip, automatic lubrication and a safety feature of finger guards on the hold-down. This No. 748 model shears up to 4-ft lengths of 3/16-in. mild steel at a rate of 200 spm. By setting a nonrepeat control it operates single stroke. **T-9-2226**

Miscellaneous Equipment

The One-Way surface broaching machine introduced by Colonial Broach & Machine Co. incorporates a series of broach carriers mounted on an endless chain to permit an almost continuous removal of metal. This unit, model VCA-10-150 is only 11½ ft high but



has a broach length of 12 ft 10 in. because of the greater broaching length provided by the chain broach principle. Duplicating tooling can be installed in sequence on broach carriers if parts being broached require less than half of the available stroke. Cutting speed is infinitely variable from 10 to 50 sfpm permitting the tool to broach a wide variety of materials at optimum cutting speeds. **T-9-2231**

A filterless dust exhauster and separator that operates on both cyclone and vacuum principles to efficiently remove light particles from large areas is announced by Abrasive Machine Tool Co. This separator, the Dustsnare, is easily installed in small space, requires ½ hp to draw 6.5 in. of water and separate down to 5 microns of a specific gravity of 1.5. It processes 309 cfm of air. A nozzle attachment will exhaust sparks from any grinding wheel. **T-9-2232**

A combination lubrication-cooling system called Lubri-cool has been developed by Giddings & Lewis Machine Tool Co. to solve the problem of variations in big machine tool accuracies due to heat generated by heavy work loads or ambient temperatures.

The Lubri-cool system does not maintain constant lubrication temperatures, but, on machines which produce pieces having extremely close dimensional re-



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F. E. ANDERSON OIL CO., INC. PORTLAND, CONNECTICUT

quirements, it cushions the variations in lubrication temperature so that the rise is closely controlled to conform with outside temperatures or operating temperatures on a gradual rising basis.

For example, if used on a boring, drilling, milling machine, the Lubri-cool system would be connected both to the headstock and milling feed unit.

T-9-2241

Landis Machine Co. has introduced the Lanhyrol, a thread rolling machine that produces quality threads by a chipless, cold forming process. Four different methods of rolling are possible to meet requirements demanded by conditions of workpiece design or material hardness. With suitable rolls, it produces left or right-hand threads



$\frac{3}{16}$ to 3 in. in diameter of all types except square or high taper. Threads to Class 2 and 3 thread fit tolerances are possible when high-production continuous rolling method is used, while tolerances up through Class 4 can be maintained by the infeed, thrufeed or reciprocal rolling methods—all on this one unit. Under normal conditions the unit produces UN form threads ranging in pitch from 5 to 32 per inch, Acme threads of 6 or more per inch, and worm threads equivalent to 8 diameter pitch and finer.

T-9-2242

Three new additions to its Lusol line of metalworking solutions are announced by F. E. Anderson Oil Co., Inc. K-7, a transparent all-chemical solution for grinding is intended for use on all steels, cast and malleable irons, titanium, carbon, rubber, ceramics and plastics. Nonfoaming, it runs flat under all conditions. Shamrock, a heavy-duty water-soluble chemical emulsion, offers good cooling and excellent extreme-pressure lubricating properties. Designed for use in all machine tools, it is especially useful when machining at moderate feeds and speeds. Unikoool, a transparent all-purpose water soluble chemical type cutting fluid provides all-purpose coolant at moderate cost.

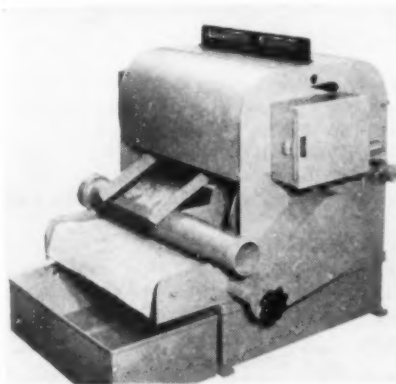
T-9-2243

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-224

6A053A

A line of combination magnetic and fabric filters is announced by Barnes Drill Co.

This filter, identified as model MPS, provides two-stage cleaning action. The magnetic drum portion of the unit attracts and removes the major con-



taminant load, and fabric filtering media removes the remaining foreign material to provide a high degree of coolant clarity.

Fabric is selected according to porosity for required limitation of particle size. With the use of the magnetic field for first-stage cleaning, the consumption of filtering media is minimized.

T-9-2251

Elmes Engineering has developed a new portable self-contained hydraulic descaler for removing forging scale from hot billets immediately prior to closed die forging operations.

It will handle billets up to 32 in. long and up to 6 in. in diameter, and can be operated with side or end feeding.

The entire descaling cycle for a 32-in. long billet can be completed in less than 2 sec.

T-9-2252

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

An automatic gear production line has been designed by Michigan Tool Co. to receive blanks and produce finished gears. In this line, blanks are fed to a universal hobber equipped with automatic loading. After the blank is hobbed, the gear goes through a washer to remove any clinging chips; and on through an inspection and classifier device which passes correct size gears and rejects oversize or undersize parts into separate chutes.

An automatic feedback mechanism is activated to reset the hobber, in either

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Finest water-soluble coolant for high-speed work — especially with carbide tools.

Lusol Super-Concentrate
Double-strength Lusol for minimum storage and handling.

Lusol K-7
The ideal transparent solution for all grinding operations.

Lusol Shamrock
An excellent combination of cooling and lubrication.

Lusol Unikool
A high-quality, low-cost universal coolant and lubricant.

Lusol Machine Cleaner
Cleans machines of all dirt, gum, fatty materials, etc.

Lusol G-3 Germicide
An efficient method of ridding machines of bacteria.

Lusol Tapcool
A series of threading and tapping compounds.

TECHNICAL BULLETINS ON REQUEST

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PORTLAND, CONNECTICUT

Lusol
BETTER PRODUCTS FOR BETTER METAL WORKING

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At Booth 915 you will see Automatic Drilling and Tapping in "Operations Kingsbury"

You'll see the operator place a die casting in a work-holding fixture. You'll follow this casting as it cycles through 10 work stations, while 28 spindles perform 83 operations from five directions. And you'll see the finished part delivered to the operator a few seconds later.

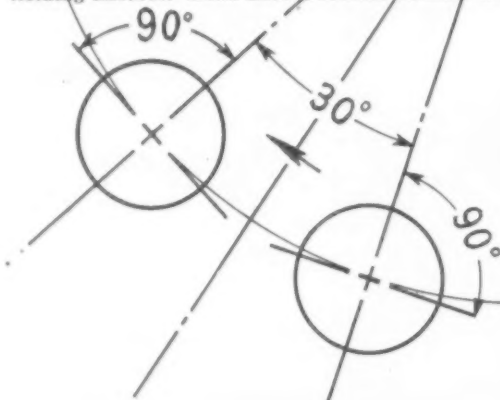
This Kingsbury machine is the twin brother of one which is now producing up to 880 parts per hour gross, at a cost of not more than 8½¢ per part. The job is unusual, even for a Kingsbury. Print called for work on 18 holes from four directions horizontally, and from the vertical. This is accomplished with seven Kingsbury units mounted on a 100-inch diameter base.

The Index Table is 26 inches diameter and has 12 work-holding fixtures. Each fixture rotates counter-clockwise 90°

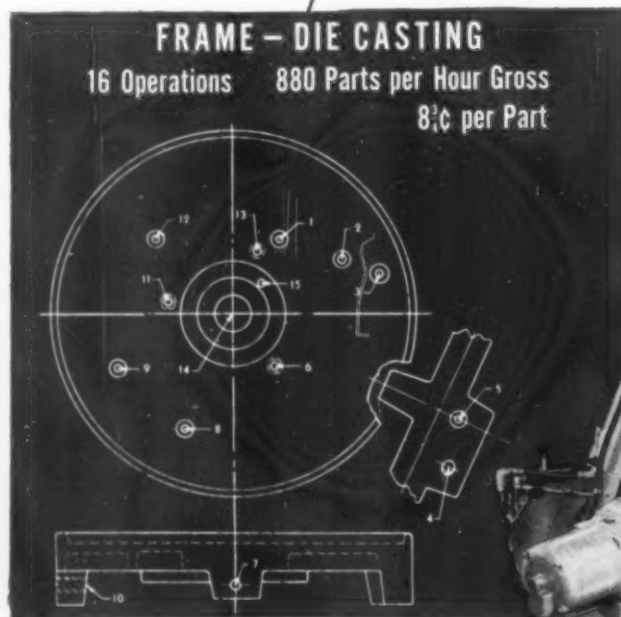
while the table indexes 30° clockwise. One operator loads and unloads the machine. Tool bushings guide the cutting tools. Electrical wiring and cabinet follow J.I.C. specifications.

Each Kingsbury is a special machine, designed and built at Keene, New Hampshire, by men who have accumulated a vast fund of experience in this highly specialized work. It co-ordinates multiple operations into a continuous production cycle — produces accurate, interchangeable parts rapidly and economically. Perhaps a Kingsbury can help you in your business.

Kingsbury Machine Tool Corp.
113 Laurel Street, Keene, N. H.

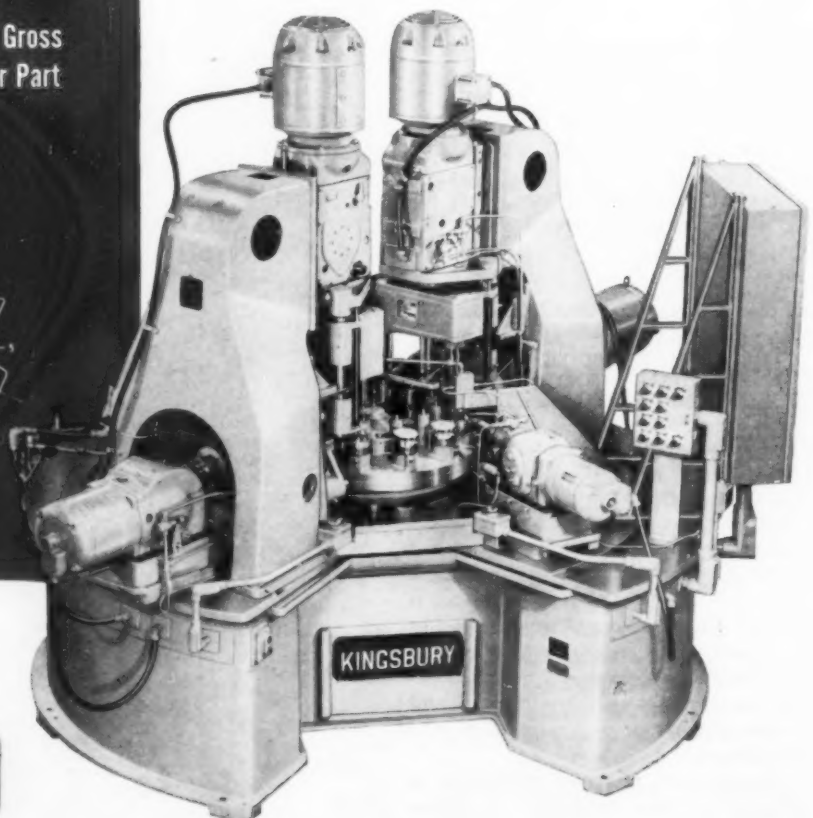


WORK PERFORMED		HOLES NUMBERED														
BY SPINDLE		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
MACHINE STATION NUMBERS																
Horizontal Units																
Drill and Countersink					1	4		2			3					
Tap					7	10		8			9					
Vertical Units																
Drill		2	1	3			2		1	3		1	2	3		6
Ream and Hollow-Mill															5	
Tap		8	7	9			8		7	9		7	8	9		
STATIONS WORKING ON HOLE		2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
WORK PERFORMED PER HOLE		2	2	2	3	3	2	3	2	2	3	2	2	2	2	1



KINGSBURY

**AUTOMATIC DRILLING
AND TAPPING MACHINES**
for Low-Cost High Production



Miscellaneous Equipment

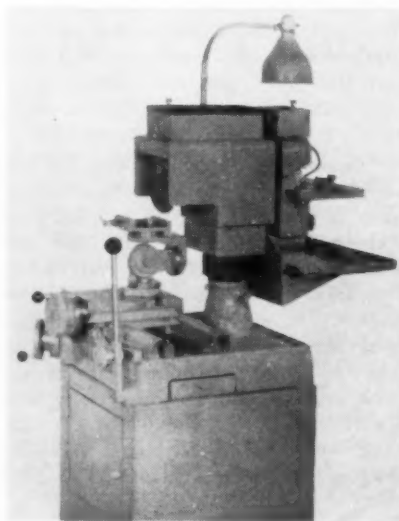
(continued)

rection, to compensate for the mechanical cause of the rejects. Correct size gears are carried by conveyor to the hopper that feeds the underpass gear finisher. After the pieces are shaved, they pass through a second washer and classifier also equipped for size control of the shaving machine. **T-9-2271**

National Automatic Tool Co., Inc. has developed a 120-ft. Holeway unit for machining cylinder heads at a rate of approximately 106 per hour. Drilling, reaming, milling, core drilling, counter-boring, spotfacing and chamfering all six sides of the part are done on the single unit. The complex operational sequence has been devised to permit 60 individual operations. The machine is so designed that chips are removed, and parts are inspected for hole depths, sizes and center distances. **T-9-2272**

Grinding Equipment

A new medium-duty chip breaker grinder with optional cup wheel arrangement has been developed by Hammond Machinery Builders, Inc. This model CM-6 moderately priced unit, available either as a bench or floor



model, offers several advantages. It will accommodate a 6-in. diameter chip breaker wheel and a 6-in. diameter cup wheel if the cup wheel arrangement is furnished. An any-angle vise with 4 swivel adjustments, furnished on the chip breaker end, provides for all angular settings and accommodates tools up to 2 in. Vertical and horizontal movements on the chip breaker end are

calibrated to 0.001 in. A work table on the cup wheel moves in and out from the wheel, and adjusts from 30 deg above to 30 deg below horizontal.

Another chip breaker grinder announced by Hammond is the CBW-6 model for heavy-duty steady-production work. It also can be furnished with a cup wheel arrangement. A $\frac{1}{2}$ or a 1-hp drive motor delivers adequate power through V-belt drive for all production grinding requirements, including plunge grinding. Besides the advantages incorporated in the CM-6 model, this unit includes a self-contained pump and tank unit with special splash guarding to provide a flood of coolant. A special spindle bearing arrangement prevents end play on the spindle. On this model, the work table on the cup wheel end, when furnished, adjusts to 15 deg above and 30 deg below horizontal. The table surface is fitted with precision ground reversible, replaceable wear plates. **T-9-2273**

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Apex Tool & Cutter Co. has announced a universal radius grinding fixture which may be mounted on any grinder with infeed for all types of radius grinding on cutting tools. The new fixture swings any part of a 360-deg radius, and is fully adjustable for front clearance and for side clearance, left or right. Interchangeable heads are available for grinding any size standard Apex serrated or round-shank tool bits or for standard square bits. **T-9-2274**

A motor-driven workhead, Model B943, introduced by K. O. Lee Co., is a compact, self-contained power unit for internal and external grinding. It can be mounted at any convenient spot on the table and, with its swivel base graduated 90 deg one side of center and 45 deg on the other, permits the workhead to swivel full 360 deg if desired. Swivel base can be easily removed so the units can be mounted on a table without the base.

The #11 B & S tapered spindle is designed to receive chucks, collet fixtures, face plates, straight or tapered sleeves, centers and like equipment. It also is available with #12 B & S and #5 Morse.

The special motor is provided with conveniently located reversing switch, which is handy for the operator regardless of the position of the worktable or rotation of the work. Motor is fully protected from dust and from any oil

entering from working parts. This power unit is easily and quickly mounted on other makes of grinders. The motor is an independent unit and may be changed easily in the field.

Standard spindle speeds are 150 and 250 rpm. Other pulley combinations are available. Any two specified speeds from 60 to 450 rpm can be obtained at additional cost. **T-9-2275**

Lathes

The automatic threading lathe, developed by Man-Au-Cycle Corp. of America, is a single-point thread cutting machine capable of cutting 30 in. of 2-in. diameter stock (4pi) in a total time of 2 $\frac{1}{2}$ minutes. Designed for capacities up to 30 in. of actual thread length, it will swing up to 12 in. in diameter. It cuts internal and external threads, both right and left-handed, taper and multistart.

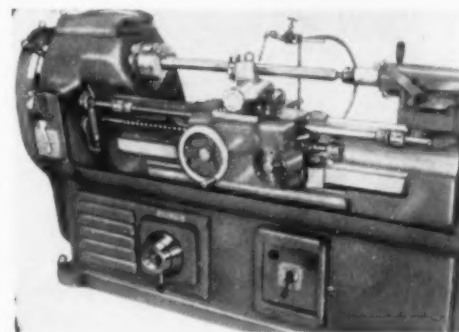
The operator only loads, unloads and starts the automatic cycle. The machine is set for a predetermined number of passes, up to 100 per minute, and includes a diminishing feed per pass for roughing and finishing during the cycle.

Setup, including change of pitch, change of diameter, length of thread, etc., is fast and simple.

Working speeds up to 2000 rpm permit full utilization of carbides. **T-9-2276**

The new 13-in. precision turret lathe is designed by South Bend Lathe Works with features for convenience, ease of operation and efficiency.

For the efficient production of duplicate parts, this machine can be equipped with chucks or fixtures for



machining castings or forgings, or with collet attachment and pneumatic stock feed for manufacturing parts from bar stock or tubing. Maximum swing over bed is 13 $\frac{1}{2}$ in.; over double tool cross-slide, 3 $\frac{3}{16}$ inch.

The universal carriage has friction

clutch drive for 48 power longitudinal feeds ranging from 0.0015 to 0.0841 in., and lead screw and split nut for cutting 48 pitches of screw threads ranging from 4 to 224 per inch. All changes for carriage feeds are easily made. Front and back tool blocks on the screw feed cross-slide take bits $\frac{7}{16}$ in. square. Cutting tools can be adjusted with extreme accuracy.

The ram-type hexagon turret has both power feed and hand feed, with an independent feed trip and stop for each of the 6 turret faces. The head

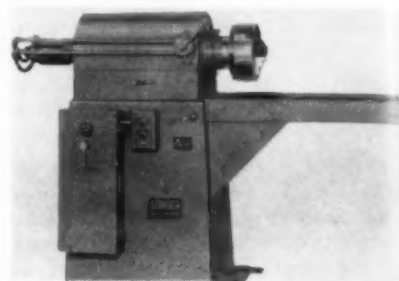
indexes automatically on the return stroke of the turret slide. Quick change gear equipment provides 144 changes for power turret feeds ranging from 0.0006 to 0.1093 in. Lever shift gears in the turret apron provide three changes for quick selection of fast, intermediate or slow feeds for turret slide.

With a two-speed motor, 12 spindle speeds range from 20 to 940 rpm. Quick change from high to low speed saves time on multiple operations.

T-9-2281

An extensive line of heavy-duty speed lathes is manufactured by Schauer Mfg. Corp.

Designed for 24-hour operation, they feature timed operation sequences where time off, time on, opening or closing of the work-holding fixture and



selection of spindle speeds can be controlled in proper sequence either automatically or manually.

Another new lathe in the line is the 2-speed, 1-hp unit for either bench or pedestal mounting which can be equipped with collets, expanding mandrels, air chucks, vacuum chucks, magnetic chucks and other types of holding fixtures for parts of irregular contour. Fan-cooled motors provide for an unusually high number of starts and stops per hour without overheating. Newly designed brakes enable split-second spindle stops, even when the machine is equipped with heavy holding fixtures. Where air-operated holding devices are used, the lathes are equipped with built-in double-acting air cylinders of 1500-lb draw bar capacity.

T-9-2282

Clausing Div. of Atlas Press Co. has developed the 6300 series 12-in. precision lathes featuring a spindle with hardened, tapered, key-lock nose and zero precision Timken tapered roller bearings. The series has 1-in. collet capacity, an enclosed headstock, an oil-bath lubricated quick-change gearbox, and an outboard, underneath drive, with dual A-belts driving spindle pulley. Tailstock with No. 3 MT ram with tang socket provides bigger tool capacity.

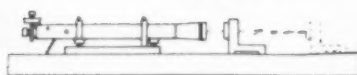
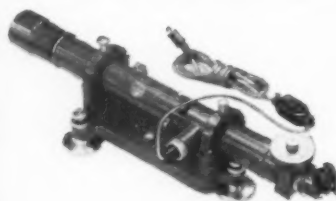
T-9-2283

A Speed Lathe, designed to accomplish a specific production requirement, has been built by the Schauer Mfg. Corp.

Pedestal of the unit is inclined 20 deg to provide maximum ease and comfort of operation. Work, held by a collet, is completely enclosed by a safety cover, contoured to the shape of the work. The machine cannot be

Optical Tooling

a complete range of proven equipment . . .



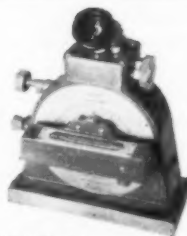
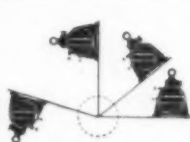
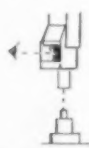
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Detects errors from a straight line or true plane to .0000025" per inch — circular deviations direct to .5 seconds of arc. Unaffected by temperature, normal shop vibration or wear.



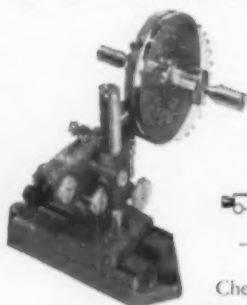
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A rapid, flexible, auto-collimating inspection device for high volume production — to check squareness, parallelism, or angles of parts. Standard readings to 1 minute or 20 seconds.

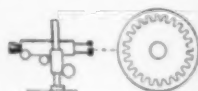


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For machine and special tooling requiring accurate angular settings, reading over a full 360° direct to 10 seconds, by interpolation to 3 seconds. Also available, model reading direct to 1 second.



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Checks circular spacings on gears, splines, index plates, dividing heads, rotary tables, machine tables—a self-contained unit quickly set up in any position.

Complete details concerning equipment and methods, with experienced engineering service, are available without obligation.

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started until the safety cover is in the closed position.

In operation sequence, work is placed on the holding fixture and guard



is closed; upon actuation of the control button, the part is rotated at slow speed for a predetermined time, then the machine automatically shifts to a high spindle speed for an additional preset time period, then stops. The operator lifts the guard and removes the work.

T-9-2291

A between-size lathe to bridge the gap in its present equipment has been added to the Pacemaker line by The American Tool Works Co. The new 32-in. Style H is offered in a variety of center distances with a choice of 18 or 27 spindle speeds. A quick-change gear mechanism permits cutting every standard thread ordinarily used without transposing or adding gears; by substituting a few additional gears, coarser than standard threads may be cut as well as diametral and module pitches.

Important feature of the lathe is the direct reading speed control. Three levers, grouped for operator convenience, are moved according to a color-coded and numbered chart, and operating speed may be thus automatically set.

For maximum ease of control and manipulation, push buttons have replaced conventional starting clutch and brake mechanisms.

T-9-2292

Drilling & Tapping

Two new tapping tools have been announced by The Commander Mfg. Co. The Multi-Tapper is a complete self-contained automatically reversing multiple spindle tapping head which may be used on any drill press. From 1 to 8 holes in any pattern may be made because of its universal adjustability.

The second tool, a pneumatic tapper, is an air actuated, high-speed single spindle tapping head which can be mounted on any drill press. It offers high spindle speeds, fast approach, automatic tap reversal and quick withdrawal from the work. Coupled with the company's spring clutch drive, it is a high-production tapping tool.

T-9-2293

The A.T.U. No. 3 lead screw tapping unit, a self-contained electrically operated precision tapping device which can be used for single or multiple-spindle precision tapping is announced by Etco Tool Co., Inc. In this device, two instant-acting electromagnetic clutches for forward and reverse ac-

tion are controlled by a built-in rheostat to regulate clutch torque. The motor operates continuously in one direction. A depth-control knob permits control of stroke to within $\frac{1}{4}$ turn of the tap. The head can be operated in any position or at any angle and can be used singly or in combination with similar units.

Electromagnetic forward and reverse clutches and a built-in rheostat control are incorporated in Etco Tool's A.T.U. No. 3 lead screw tapping machine to permit torque of clutches to be regulated over a range of from 0 to the equivalent of 2 hp. Depth control permits settings to within $\frac{1}{4}$ turn of the tap. A wide choice of direct-mounted motor drives as well as single or multiple pulley drives where motor is not

Sets 'em
twice as
fast!



New Rotor "02" Nutsetter cuts job time 50%

Nutsetters here, on radio chassis assembly, operated at 1200 rpm. Changed to Rotor S-02 LC Air Nutsetter... operates at 2500 rpm and handles easier. Cut time in half. Savings paid for Rotor tool in 7 weeks. Let's see what we can do for you with the new Rotor tools! Ask for Bulletin 46.



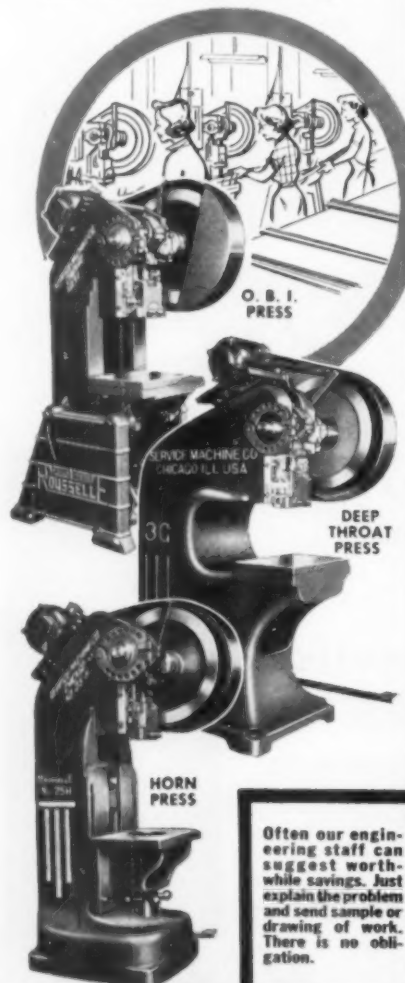
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Expect *More* with a **ROUSSELLE**

More strength where it counts...
More accuracy where it's needed...
More simplicity where it helps...

...to turn out first rate work **FAST**
with steady, dependable regularity

You'll like the economical run-of-job cost, the simpler maintenance, the easier set up and operation and the wider variety of work each one can handle. And **YOU'LL LIKE THE PRICE** when you compare Rousselle specifications and quality... Ask for condensed catalog.



Rousselle presses are sold exclusively through leading machinery dealers.

SERVICE MACHINE CO.

Mfrs. of Rousselle Presses

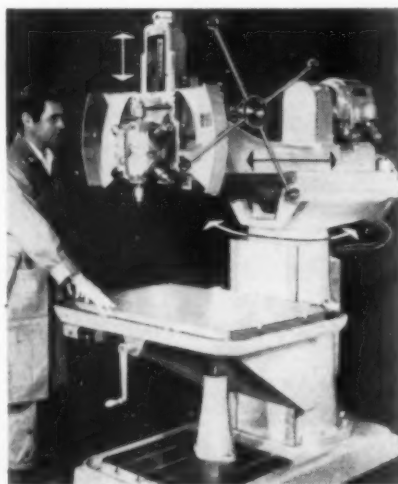
2310 West 78th Street • Chicago 20, Illinois

INDICATE A-9-230-1

direct-mounted is available. Used with multiple tapping head and a special work-holding fixture, this unit provides fast, simple and accurate operation.

T-9-2301

Burg Tool Mfg. Co., Inc. has designed a radial turret drill featuring preselective spindle speeds ranging from 225 to 3000 rpm. Other advantages of the machine are preselective



depth control for each spindle; 8-in. stroke; power indexing; and hydraulic clamping. Powered by a 2-hp motor, the unit has a 3/4-in. drill capacity in steel, a maximum radius of 42 in., minimum radius of 15 in. and table size of 36 by 24 in.

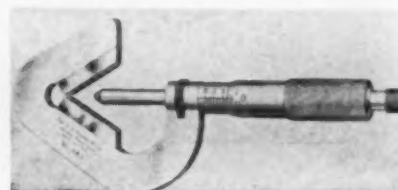
T-9-2302

The 18-in. heavy-duty drill press designed by Clausing Div. of Atlas Press Co., drills 1-in. cast iron or 3/4-in. in steel. It has a No. 3 MT spindle, with 6 1/2-in. spindle travel. Built-in switch, honed bearings for quill, ball-bearing equipped spindle, hand feed or gear-driven power feed are other features of the unit.

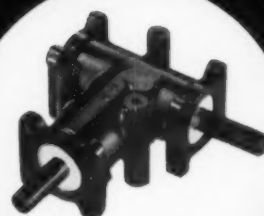
T-9-2303

Gaging & Inspection

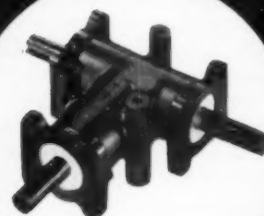
Among several new gaging instruments announced by The L. S. Starrett Co. is the No. 167 series of radius gages which makes available five gaging surfaces on each gage for both convex



ANGLgear Horsepower UP...



MODEL 340



MODEL 350

...but price stays down!

3 hp at 1200 rpm! That's the new rating of the rugged 2 and 3-way ANGLgear models shown above. And — we repeat — there is no change in purchase price.

The expanding ANGLgear line — now including 1/3, 1 and 3 hp units available with 1-1 or 2-1 gear ratio and with either 2 or 3-shaft extensions — enjoys wide acceptance in many fields. It's sold only through your local distributor. See our literature in the product design section of Sweet's Catalog.

AIRBORNE
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HILLSIDE 5, NEW JERSEY
INDICATE A-9-230-2

The Tool Engineer

and concave radii. Every gage in the set may be used separately for maximum accuracy and convenience. Four different sets cover the range of $\frac{1}{64}$ to $\frac{1}{2}$ in. by 32nds or 64ths.

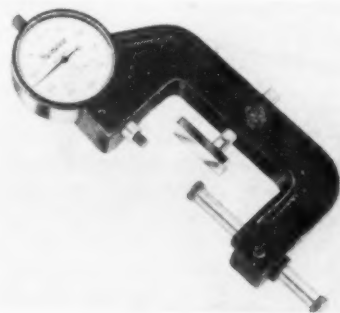
With the micrometer specifically designed by Starrett for measuring odd-fluted taps, milling cutters, reamers, etc., there is no need for special fixtures. Used like a conventional outside micrometer, it permits readings to be taken directly in thousandths. Available in two models, the No. 483 has a Vanvil designed to accommodate cutters with three flutes; the No. 485 accommodates cutters with five flutes.

T-9-2311

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Chicago Dial Indicator Co. has developed a Geneva dial indicator with a continuous reading dial for 0.001, 0.005 and 0.0001-in. graduations, and threaded stems for fitting bases and fixtures to gage, making them usable for special checking jobs. A special lever movement gives accurate direct reading by use of lever arms which replace complex gears. These indicators also have magnetic base holders which attach with a 100-lb pull to flat or curved surfaces.

Another Chicago Dial precision checking instrument is the Geneva dial snap gage (illustrated), which is used for exact comparisons of work-



pieces. Its easy adjustability and the large flat backstop which precisely positions workpieces offer unusual speed and convenience. It is available in four models for different size work.

T-9-2312

The dial snap gage Setmaster introduced by Boice Mfg. Co. is a functional instrument that can quickly be set to an exact setting for checking the dial indicator gage. With this instrument there is no need for setting disks. Be-



cause it is readily adjustable, the Setmaster is useful for prototype work, short-run production, receiving inspection, emergency tooling, process dimensions and final inspection. It allows quality control to be used on jobs normally checked by fixed gages due to the lack of a complete indicator gage setup, gage and master.

Another new Boice gage is the fully adjustable large diameter gage Model #985. By interchanging the tubing center sections, inside or outside diam-

MOST SIMPLE IN CONSTRUCTION

Longest

IN ACCURACY

LINCOLN PARK DIAL SNAP GAGES

A complete line of dial snap gages . . . constructed on the simplest design principle . . . guaranteed to maintain extreme accuracy over long periods of time!

Lincoln Park Dial Snap Gages are designed to give a direct reading from the measuring anvil to the indicator. There are no bearings, levers, shafts or cams to

wear or get out of adjustment. Parallel anvils are carbide tipped. Precision adjustments of the upper anvil can be made within a $\frac{1}{4}$ " range. The entire construction is completely shockproof.

A new bulletin describing in detail both standard and special Lincoln Park Dial Snap Gages is now available. Your copy will be sent immediately upon request.



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To celebrate the production of General Motors 100,000,000th Diesel horsepower —GM has turned 20 acres of Chicago Lake Front into a dazzling dream land—and filled it with the very latest and most astounding examples of modern power for progress. Here you can see and study the first All-American-Designed Lightweight Train. See a

replica of the Vertical Take-Off Plane. Inspect a Diesel-powered Submarine. Watch a modern Diesel-powered farm in operation. See a modern sawmill, a cotton gin and an oil-drilling rig at work. Examine factual educational exhibits of Diesel and jet power development. And dozens of other excitements, including the World's First Technological Circus.

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★ ELECTRO-MOTIVE ★ EUCLID ★ FABRICAST ★ FRIGIDAIRE ★ GMC TRUCK & COACH ★ GM RESEARCH

Gaging & Inspection

(continued)

ters from 6 to 48 in. are easily made. This gage rests on the work surface on test buttons that have an inch of adjustment. Gaging depth is easily adjustable to 2 in. in depth; greater depths are quickly available. **T-9-2331**

A fully automatic Rockwell hardness testing machine, developed by Wilson Mechanical Instrument Div., American Chain & Cable Co., is capable of testing the hardness of both ferrous and non-ferrous metals, in hard or soft condition, at the rate of 1,000 to 12,000 tests per hour. This efficiency is accomplished because the design incorporates tiny



photo transistors and intricate timing mechanisms. Manual testers generally average 200 to 400 tests in the same period.

In the automatic operation, parts to be tested are power fed into the machine and placed into position beneath a diamond penetrator. Testing loads force the diamond into the part to determine material hardness, which can then be read on a dial. Parts are then automatically classified and sorted according to desired hardness limits.

The photo transistor circuit can be set to control the hardness limits as close as two points. **T-9-2332**

Control Equipment

A new relay for machine tool, press and similar control devices has been developed by Clark Controller Co.

This small, compact type PM relay for heavy-duty service, occupies minimum panel space, without reducing life or capacity, crowding wiring, or com-

plicating maintenance. Its design reduces maintenance problems and minimizes parts stocking.

The new relay features a modular design with each pole, or contact assembly, mounted on a separate detachable melamine block. Individual poles can readily be removed, and contacts easily converted from normally open to normally closed, and replaced. Closed tops of the blocks form a natural shelf on which wiring can be run. When relays are mounted side-by-side, almost no space is required between them.

Up to eight poles are available without double-decking. A wide variety of standard relays is available, from 2 poles to 12 poles. Special vertical-space-saving two-pole designs and horizontal-space-saving 8-pole types are among the relays available.

The design, because of its advantages, permits "building" relays with any number of poles up to 12, in any normally open or normally closed combination, from a very small number of different parts. **T-9-2333**

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A control center design produced by Clark Controller Co. permits an increased number of motor starters to be installed in a smaller space.

The center is 20 in. wide, 14½ in. deep, and 90 in. high, providing room for 6 size 1 or size 2 starters in each vertical section.

A line-up of vertical sections can be installed in a confined space since all internal apparatus can be assembled or removed from the front. This feature also simplifies maintenance since internal parts of each vertical section are completely accessible without disturbing adjacent sections.

Doors are attached to vertical sections so that compartment openings can be closed when the plug-in starters are removed.

The control center is available in NEMA types A, B, or C construction. With type B construction, terminal boards are mounted on the plug-in starter units. With type C construction, terminal boards may be mounted either at top or bottom. **T-9-2334**

A unit-design which permits all needed types of control apparatus to be easily organized into a complete sectionalized motor control center has been developed by Cutler-Hammer, Inc.

This control center, called Unitrol, is easily, quickly and economically

built up for specific jobs without special engineering. The assembly contains only individual controllers, disconnect switches and accessories required.

Unitrol is made available either completely wired or with provisions for wiring on the job.

Later, should a specific job alter, the initial unit can be changed, extended



or contracted as easily and economically as when it was first built up.

The control center also may be shaped to requirements—in a straight line, L-shaped or U-shaped—as considered most advantageous. **T-9-2335**

A tape fed programmer, which delivers up to 140 simultaneous closing contact signals, has been developed by Hillyer Instrument Co., Inc. It may be applied to automatic locating and drilling machines, other machine tools, industrial equipment and processes to avoid the possibility of human error.

When this new programmer is used on machine tools, the operator merely loads and unloads the machine. For its operation, information is punched on the vinyl tape; the programmer then rewinds and recycles automatically. As it feeds into the machine to which it has been attached, the tape activates all functions being controlled while delivering directly usable relay currents without internal or external amplification.

Normally it will read a new set of information every two seconds, though cycling time from position to position can be varied according to machine and job requirements. The programmer also can deliver signals to advance or retract, select, start and stop tools, and any other function necessary to make machine operation automatic.

T-9-2336

NEW BELT GRINDER with built-in "conveyor" grinds up to 14,000 SMALL PARTS AN HOUR!



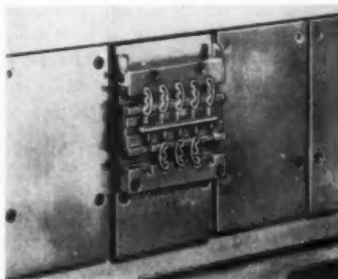
ENGELBERG

BG-8 AUTOMAT

for mass production of small parts

● The "conveyor" on this new Engelberg Porter-Cable wet-dry belt grinder is an automatic continuous work feed device with 21 fixture plates. These plates travel across the face of the 8" abrasive belt at speeds of 1090, 1350 or 1750 per hour. Depending on the number of pieces loaded on each plate, an operator can grind up to 14,000 or more small parts an hour.

Loading of each fixture is manual—ejection can be automatic. Work is advanced quickly to the belt surface, is fed slowly into the abrasive during its passage across the belt, is retracted quickly before leaving the belt. The finish is a straight-line finish with an accuracy of $\pm .0005$ " to $\pm .001$ ".



● Close up of fixture plate capable of holding 10 small valves... one of the many ways large quantities of small parts can be mounted.

MAIL COUPON FOR FULL DETAILS

THE **ENGELBERG** HULLER CO., INC.

The Engelberg Huller Co., Inc.

309 Seneca St., Syracuse, N. Y.

Please send complete information on new BG-8 Automat Abrasive Belt Grinder and name of nearest distributor.

Name.....

Firm.....

Address.....

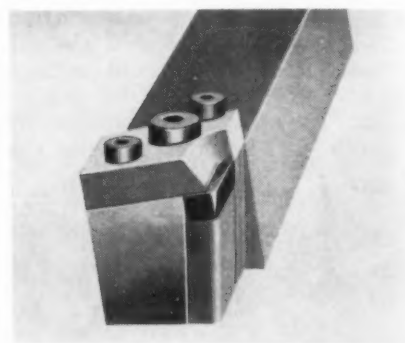
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Toolholders & Bits

Vascoloy-Ramet Corp. has introduced a new toolholder for throw-away inserts, which incorporates a 6-deg positive side rake for machining metals and materials requiring the use of positive rake tool design.

Incorporated in the toolholder is a cast-alloy chip-breaker plate with unusually high resistance to abrasive wear. With the addition of this plate there is no necessity for grinding chip-



breakers in the cemented carbide insert. The chipbreaker plate is available in two styles; a standard plate incorporating a chipbreaking width which meets standard practice and a blank plate which may be ground with standard grinding wheels to fit individual machining problems.

Initial production of the new toolholder will be limited to the more popular shank sizes and styles for straight turning (TAPR), and 15-deg lead angle turning (TBPR). A complete series of shank sizes and standard styles already being used in the negative style toolholders will be produced. Both new styles are designed to the same general specifications and dimensions found in the dependable and familiar style "A" straight turning and the style "B" 15-deg lead angle turning brazed shank tools. **T-9-2341**

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

The Thro-way toolholder for carbide throw-away inserts, manufactured by Adamas Carbide Corp., features an adjustable carbide-surfaced combination chip breaker and top clamp for unusual chip control.

The chip-breaker clamp is fully and instantaneously adjustable on an interlocking serrated friction table designed to prevent back movement, even on the heaviest cuts. Rapid heat dispersion is designed into the clamp, which can be

adjusted to give maximum depth of cut without chip interference.

An indexable and replaceable hardened tool steel anvil assures positive seating of the carbide insert.

A simple change of the anvil makes possible the use of thick or thin throw-away blanks having different corner radii.

T-9-2351

A series of planer double serrated tool bits and holders are available from Apex Tool & Cutter Co. In these tools, an inserted bit holds a tapered carbide plug that can be indexed to present new cutting edges, and may be ground to maintain the same cutting angles regardless of position. Indexing is done in place and the carbide can be changed without removing the inserted bit from its holder.

T-9-2352

Lehmann Boring Tool Div. of Fulton Iron Works Co. has developed a line of block type boring tools which avoid need of cutter adjustment by the operator. They readily maintain tolerances of 0.001 in. on face spacing as well as on diameter and are interchangeable both as to size and arrangement. They offer efficient operation both for general purpose boring or for highly specialized operations such as automatic deep hole recess grooving because each tool is engineered to suit the specific job. The block type tools are available in high-speed steel, cobalt, stellite or tungsten carbide tipped.

T-9-2353

Components & Attachments

A 3-jaw, scroll operated, compensating chuck, designed by Cushman Chuck Co., provides an appreciable amount of compensation and permits gripping of irregularly shaped workpieces which have been previously centered by another means.

Jaw compensation is achieved by a two-piece scroll, the lower half of which is engaged by the pinion and is concentrically located at all times by the chuck hub. Clearance provided in the chuck body permits the upper jaw controlling half of the scroll to float, thus providing the compensating feature. A drive lug located on the lower scroll section, loosely fits into the upper scroll section.

Cushman also has announced an improvement and simplification of the jaw adjustment feature of its air operated screw adjustable jaw chucks. The new design permits quick adjustment, prevents backlash, and provides a positive lock in either direction of holding. It is now possible also to lock the jaw assembly without any tendency for top jaw creep.

T-9-2354

Three new series of clutches and a new clutch coupling unit are announced by Formsprag Co. A new small clutch offers high torque capacity and long life with minimum maintenance.

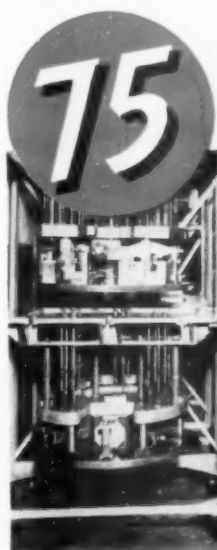
A large bore clutch was designed for backstopping applications requiring large-bore sizes. The Series 50 clutch was developed for applications where adequate inner race concentricity is provided. It is particularly useful where the backstop can be incorporated into a bearing bore and an existing shaft extension serves as an inner race.

For applications requiring an over-running feature, as when coupling two shafts, Formsprag has developed a clutch-coupling unit to cover the complete range of operating conditions.

T-9-2355

The Accra-Set chuck has been designed by The Cushman Chuck Co. for applications where accuracy must be held to closer limits than possible with standard scroll type chucks. Adjustment is simple and quick, and the chuck will repeat to 0.0005 in. or better total indicator reading. Because of its accuracy and jaw capacity, the Accra-Set chuck can replace the most accurate collet chuck and its necessary range of collets.

The adjusting mechanism of the Accra-Set chuck consists of four equally spaced adjusting screws about the periphery of the chuck body and placed on a compound angle. Because of the way the screws function, the body is rigidly and centrally positioned with assurance that no slippage or shifting will occur during heavy inter-



SEIBERT-EQUIPPED Machine Heads

at
**WOODWARD
GOVERNOR
COMPANY**



Simplify Tooling Changeovers . . . Help Build Precision Parts Faster

At Woodward Governor Co., Rockford, Ill., an ingenious method of machine head storage reduces setup time and minimizes damage to spindles and tools. The main illustration above shows how 75 interchangeable heads, equipped with more than 1500 Seibert precision-built spindles, are neatly arranged and numbered to permit fast and easy removal in and out of storage to machine location. Woodward Governor, another company whose production requires precision tolerances and high quality, has been using Seibert tools for more than 5 years.

3 Reasons Why Users Specify SEIBERT

Investigate the 3 reasons why users specify Seibert tools. You will find they meet exacting tolerance requirements . . . you save money for Seibert tools are lot produced in a wide range of standard sizes . . . and your orders receive prompt handling because Seibert specializes in production tools only.



FREE DATA
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and describing
the complete line
of Seibert Multiple
Drill Spindles.



Upper and
Lower Drive
Assemblies



Pinion Drive
Shafts



Universal
Joints



Bracket Spindle
Assembly

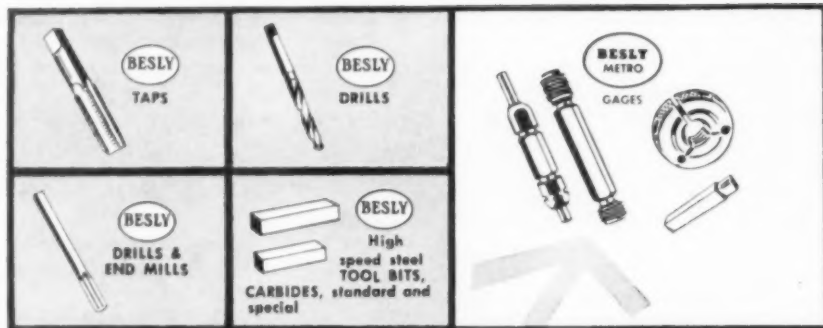
Adaptor

SEIBERT & SON, INC. CHENOA, ILLINOIS

Quality MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS



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New Additions to the **BESLY** cutting tool line



Now You Can Get Precision Gages and Carbide Tipped Tools from Besly—and Be Sure of Cost-Cutting Quality

To serve you better, Besly has recently purchased the assets of the Metro Tool and Gage Co. of Chicago, for 15 years a manufacturer with a reputation for outstanding quality, supplying precision gages and carbide tipped tools. This makes the Besly Cutting Tool Line even more complete, enabling you to get a wider selection of Besly *Quality* Cutting Tools that mean longer life and greater accuracy in your shop. A broader Besly selection gives you the advantage of one quality source responsible for all the elements of your machining operations. The net result is *lower final costs* for you as Besly can furnish tools and gages for the

whole job, from drilling or turning right through to final gaging. Paper work and purchasing are simplified as you now can buy all your tools from one proven source. See your Besly distributor or write for catalog information.



**BESLY-WELLES
CORPORATION**

Established in 1875 as Chas. H. Besly & Co.
118 Dearborn Avenue
Beloit, Wisconsin

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rupted cuts, sudden stops and starts of the machine spindle, or in its use on indexing devices.

The chucks are available with 3 or 6 jaws in 6, 7½ and 9-in. sizes. These chucks are furnished with a straight recess back and require adapter plates for spindle mounting. **T-9-2361**

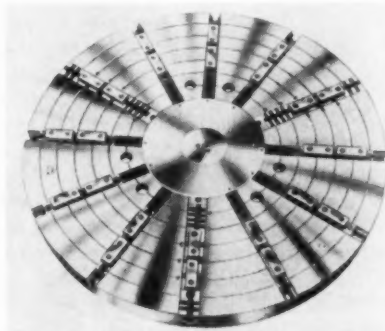
Designed for precision, durability and smooth, easy operation, a new line of precision collets with heat-treated and form ground precision threads has been announced by South Bend Lathe Works.

These ground thread collets, called Red Arrow, are manufactured for all current models of South Bend Lathes.

T-9-2362

The new Tru-Set chuck manufactured by Horton Chuck Div. of The E. Horton & Son Co., offers accuracy of 0.0002-in., tir. Main design feature of this new chuck is the micro-screw adjustment of the chuck back which enables the lathe operator to align the workpiece practically within the limits of the accuracy of the lathe. It is available with either 3 or 6 jaws; each has 3 operating pinions for opening and closing the jaws. Each chuck is supplied with two sets of jaws and is available in sizes of 4 to 12 in. in diameter.

A centering device, especially designed to be incorporated in its line of J-Type chucks used in machining jet engine parts, is also announced by



Horton Chuck, Div. of The E. Horton & Son Co.

This controlled centering pressure chuck has the advantage of being able to center thin-walled rings and parts at a preset centering pressure without distorting them during the centering process.

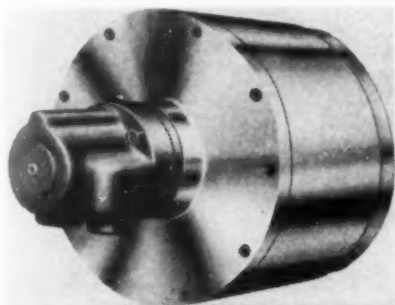
The 3 universal jaws moved in toward the workpiece, stop automatically when all three jaws come in contact with the piece. The 12 independent

jaws are then moved in to pinch the part in its "as is" position.

Adjustable centering pressure feature prevents possibility of distortion to the part due to excess pressure applied by the operator. **T-9-2371**

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

A rotating hydraulic cylinder announced by The S-P Mfg. Corp. provides greater force in a smaller area



than is available with an air cylinder. Built in various bore sizes, it is rated for use with pressures up to 750 psi and at speeds up to 3,000 rpm. The cylinder is alloy iron and is balanced for high-speed use. **T-9-2372**

Air cylinders of square end, space-saving design, announced by The S-P Mfg. Corp., are available in 11 bore sizes from 1½ through 14 in. and with 21 types of mountings. Designed to JIC standards, they feature brass tubes to avoid corrosion; removable bronze cartridge containing wiper and rod packing, and cold-rolled steel end plates. On cushioned models, cushions float on an O-ring for accurate self-alignment. These cylinders can be supplied with either single or double rod end. **T-9-2373**

Milling Equipment

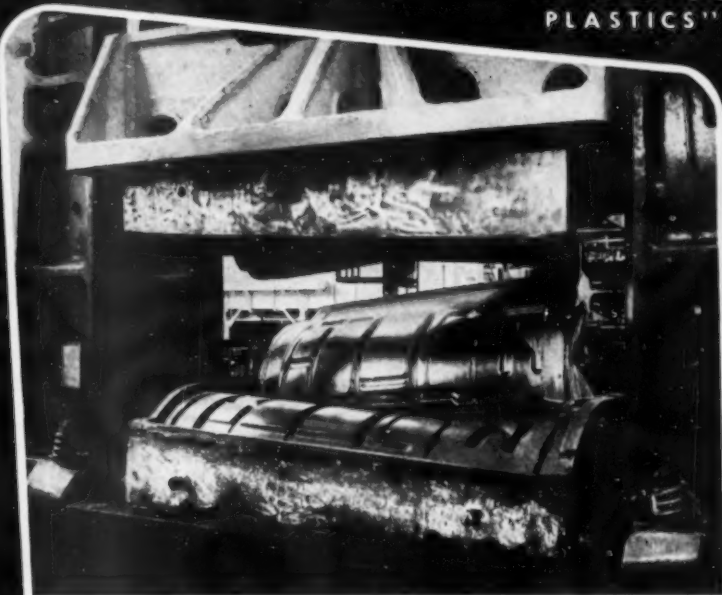
Prime feature of the dial type high-speed universal milling machines announced by Graham Machine Tool Co. is the power rapid traverse, forward and reverse, in all directions. No. 50 National Standard taper in the spindles allows interchange of cutting tools with all modern millers.

The tables have wide ranges of automatic feed rates in all directions up to 26 ipm; rapid traverse is 71 ipm.

Spindle speeds up to 1470 rpm allow efficient cutting with carbide tools on brass, aluminum and magnesium.

Visual oil control is supplied for all

"IDEAS IN THE MAKING WITH CIBA PLASTICS"



Hear this!

An outstanding development of great significance in the use of synthetic resins for tooling is this new drop-hammer die at the Lockheed Aircraft Corporation. The high impact die facing material is EPOCAST*, developed by FURANE Plastics based on CIBA Araldite Epoxy Resins. It is hard enough to form most gages of aluminum and thinner stainless steels. In addition to exceptional mechanical efficiency, the EPOCAST facing material economically eliminates die-grinding and spotting that is needed when conventional tools are used. Worth looking into . . . as are all CIBA-base plastics. *Trade Name

Do this!

Save 50% of your tooling costs by writing us for full information.

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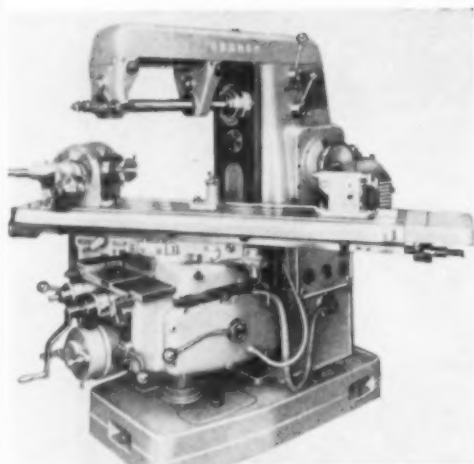
Name

Company Title

Address

Type of Business

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-237



moving parts including lead screws, arbors, etc.

The machines, built in sizes 2, 3 and 4, are supplied with universal dividing head, heavy-duty vertical milling attachment, arbor, coolant system and outboard brace as standard equipment.

T-9-2381

The Portage Machine Co. has introduced a combination horizontal boring, drilling, milling and duplicating machine. This versatile, multi-purpose machine permits all these machining jobs, including duplicating in one setup by a single operator with no change-over time lost. The combined Portage

mill and Turchan Hydraulic Follower can accurately bore a series of holes, and mill pockets and outside bosses. This new machine offers production economy due to the trend toward irregular shapes and designs in modern stampings.

Machine has 36 spindle speeds, ranging from 8 to 1,000 rpm, 18 milling feeds to table, saddle and head. For rigidity, base construction of the mill



is unusually wide and deep, and the box section is cast in one piece. Outer base walls directly under the column are continuous without cored openings and further reinforced by vertical ribbing, offering unusual rigidity and additional safety factors.

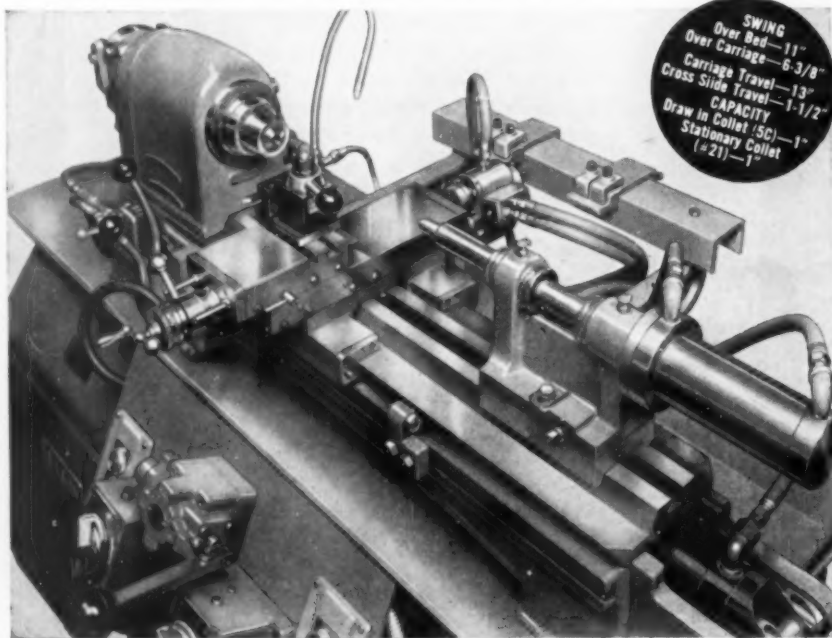
T-9-2382

ELGIN PRECISION

for more than 50 years

Announces its **NEW**

PRECISION HYDRAULIC TRACER LATHE



Elgin Tool Works announces the development of its New Hydraulic Tracer Lathe, a precision machine for close duplication of smaller parts in large or small lots.

This machine is hydraulic in its primary duplicating functions and includes air operated features to facilitate part loading, unloading and clutch-brake drive operation.

See our Booth No. 320 at the Chicago Coliseum

ELGIN TOOL WORKS, Inc.

1713 Berrean Avenue, Chicago 13, Illinois.
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-238

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Horizontal, vertical, angular and universal milling operations may be performed on the Quartet, introduced by U. S. Burke Machine Tool Div. This #2 floor type milling machine serves all types of milling needs with a single machine, making it particularly suitable for tool, die and maintenance shop-work where a wide variety of work is performed, or for production runs on medium-sized parts.

Switching from a normal horizontal milling machine to a universal horizontal miller is fast and simple. Universal milling operations may be performed without changing the saddle and table's position.

An independently motor-driven, heavy-duty power feed vertical milling head is mounted on the rear of a rectangular overarm casting. To change the machine from horizontal to vertical operation merely requires indexing the turret 180 deg to bring the vertical head over the table.

For unusually cumbersome or heavy milling work, it is possible to mount

the workpiece in a fixture on the floor on either side of the column, and to move with either the horizontal or vertical spindle. It is also possible to operate both the horizontal and the vertical spindle simultaneously, if such operation is advantageous. The horizontal spindle provides infinitely variable speeds.

T-9-2391

Saws

A high-speed welded edge hole saw designed by The L. S. Starrett Co. cuts clean, round holes in any material. These shatterproof, heavy-duty hole saws are double welded to combine a high-speed steel cutting edge with an extra strong body which, in turn, is



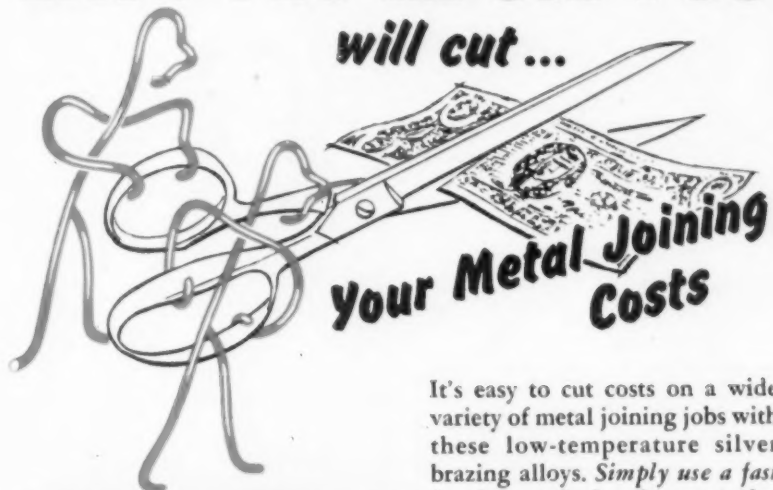
welded to a rigid steel cap. The cap is threaded to accommodate interchangeable arbors that incorporate a 1/4-in. high-speed steel pilot drill. Arbors are available with 1/2 or 3/4-in. hexagon or 1/4-in. round shanks. A wide range of saw sizes provides for cutting holes from 3/8 through 4 1/2 in.

T-9-2392

An automatic power saw, designed primarily for the recently announced Demon high-speed steel saw band, has been introduced by The DoAll Co. The machine, which will cut a wide variety

EASY-FLO and SIL-FOS

will cut ...



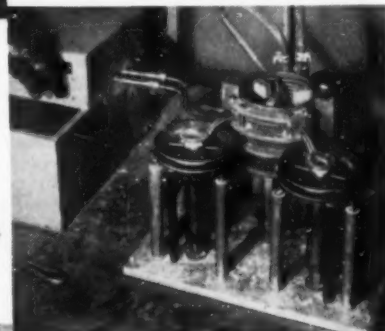
Your Metal Joining Costs

It's easy to cut costs on a wide variety of metal joining jobs with these low-temperature silver brazing alloys. *Simply use a fast heating method and a setup that promotes fast handling of parts.* In that way you get full benefit of the remarkably fast brazing of strong, virtually indestructible joints inherent in the exclusive composition and properties of EASY-FLO and SIL-FOS. Take this job for example — brazing one-piece stamped pulleys to shafts:



1 One girl slips pulleys onto shafts and applies HANDY FLUX. The other puts a ring of EASY-FLO 45 wire on top of each assembly.

Assemblies with preplaced alloy rings, are put in fixtures which accurately position pulleys, and are brazed automatically by induction heating.



2 Heating time for 2 assemblies is 25 seconds. Production per 8-hour shift is 1500. Assemblies are tested to 4000-lb. pull.

3 Photos and data courtesy of Zatzko Metal Products Co. Euclid, Ohio



THE FULL STORY WILL CONVINCE YOU It's all in words and pictures in BULLETIN 20 — including useful pointers on joint design and time-labor-cost-saving brazing production methods. Write today for a copy.



HANDY & HARMAN

General Offices: 82 Fulton St., New York 38, N. Y.

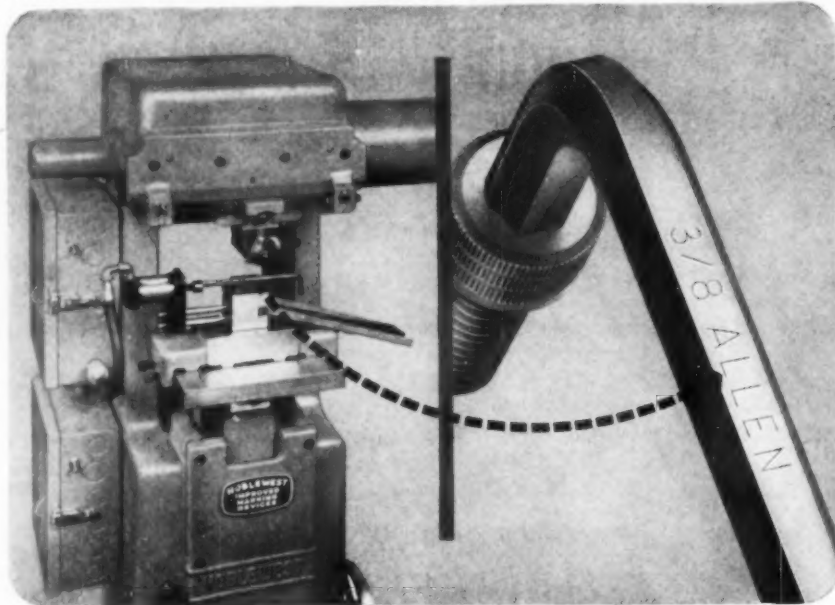
DISTRIBUTORS IN PRINCIPAL CITIES

There's no "...or equal" for EASY-FLO and SIL-FOS

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ANOTHER LEADER OF INDUSTRY MARKS WITH NOBLEWEST



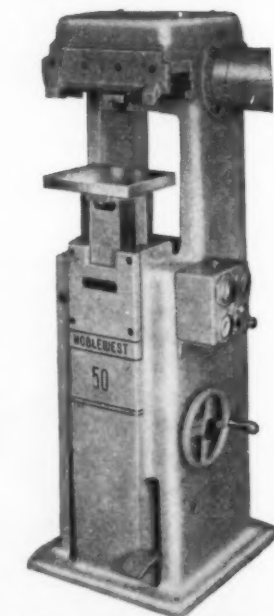
Model 50P1-395 Roll Marks manufacturer's name and size identification permanently into all sizes of Allen Head hex wrenches.

HIGH PRODUCTION MARKING

WITH NEW

Cyclomatic Control

This general purpose marking machine combines the original NOBLEWEST Roll Marking process with CYCLOMATIC CONTROL . . . an exclusive NOBLEWEST electro-pneumatic circuit for completely automatic cycling. When set for automatic operation the machine cycles continuously with no further attention required from the operator. A dual control system also provides for semi-automatic operation or for short production runs. This model can also be equipped with an air ejection system (see above) plus an automatic hopper or dial feed. The basic Model 50P1 features a low price, plus quick delivery! For additional details on how NOBLEWEST Marking Machines, tools and dies can lower your production costs, write the Noble & Westbrook Manufacturing Company, 16 Westbrook Street, East Hartford 8, Conn.



At left are Noblewest Precision Roll Marking Dies used for marking Allen wrenches. Inscription is duplicated three times on each die, thus tripling the die life.

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MARK IT BEST WITH

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ORIGINATORS OF THE ROLL MARKING PROCESS

EQUIPMENT FOR MARKING • GRADUATING • EMBOSSING • NUMBERING

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of tough metals at high speed, also offers an unusual hydraulic nesting fixture which permits accurate cutting of stacks of small diameter rounds. The fixture which provides this advantage is synchronized with the sawing cycle so that it automatically clamps and unclamps rounds as required during automatic indexing.

T-9-2401

Miscellaneous Equipment

Northwestern Tool & Engineering Co. has developed V-pads to be used as solid locators or as clamps with toggle shoe clamps. These clamps can now be furnished with a small or a large diameter shoe. The V-pads are available in 1 and 2-in. sizes to fit on 1/4-20 and 5/16-18 screws. In the 3/4-16 sizes, they are available in 1, 2 and 3-in. widths.

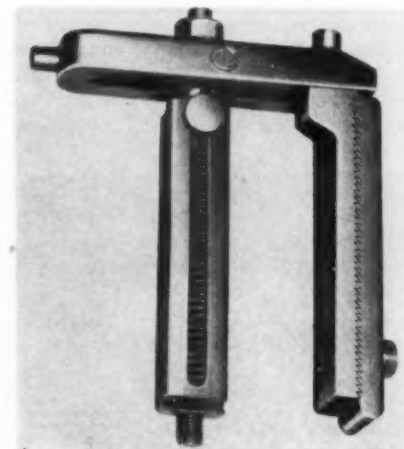
Because they are not heat treated, the V-pads may be drilled, tapped or counterbored to suit, as well as used solid.

T-9-2402

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Hi-Lo rapid adjustable clamps for toolroom setup work are announced by Hi-Lo Tool Products.

These high-tensiled, self-contained positive clamps are offered in range of sizes to meet numerous toolroom needs. They are available in finger clamp,



strap or goose neck types which are interchangeable. Only 1/4 turn is required to disengage for adjustment. Because fine adjustments are not necessary, 3/16-in. serrations are employed for added strength. Key and keyway design makes possible 180-deg position to be obtained correctly and quickly, offering versatility in limited clamping areas. Serrations of 1/8 in. for fine ad-

justment plus radius on the step bar and clamp allows rigid clamping. The serrations are designed to allow a self-locking feature requiring only a finger pressure for tightening, and which will not disengage under any clamping conditions.

Adapters for vertical angle plate clamping are offered in ranges of 1½ to 2½ in. up to 8½ to 17 in. for all types of setup work. They offer time-saving and efficient clamping operations besides avoiding stripping of bolts, special blocking and shimming.

T-9-2411

Vapor Blast Mfg. Co. has designed a liquid honing machine for small parts finishing.

Capable of performing most of the tasks of larger machines, the new VB



Junior model 1818 is completely self-contained, requiring only water, air, power and exhaust connections. It requires air source of only 15 to 20 cfm at up to 90 psi.

Dimensions of the unit are 51 in. high, 18 in. deep, 18 in. wide. **T-9-2412**

Barry Controls, Inc. has developed a spring mount for applications where it is necessary to isolate low speeds and high impacts. Available in a variety of sizes, with 1 to 9 springs, the spring mount has an effective load range of from 250 to 6700 lb per mount.

T-9-2413

Melard Mfg. Corp. has introduced 2 series of Mel-o-Flo coolant aerators for use with soluble and most light oils for machining and grinding operations requiring large volumes of coolant. The aerator connects directly to the coolant line and mixes atmospheric air with coolant resulting in a nonsplash, aerated mixture that clings to work and tools.

The new #700 and #800 series operate at pressures as low as 2 psi, making them suitable for installations using centrifugal pumps. The #800 series delivers twice as much coolant as the #700 series. A self-cleaning mechanism in the aerator purges it of dirt or chips whenever the coolant supply is interrupted. Aerated coolant clings to the work and tools, reducing centrifugal throw-off and providing superior wetting action and heat dissipation.

T-9-2414

A line of superstrength socket head setscrews that can be turned 40 percent tighter than former models is announced by Standard Pressed Steel Co. Available in conventional diameters from No. 0 to 1 in., these high-torque setscrews have fully formed precision threads, deeper sockets, harder socket walls, harder, tougher, self-locking knurled point.

Two other new SPS product lines also are announced. Hollowell storage wall units, form nests of drawers—3

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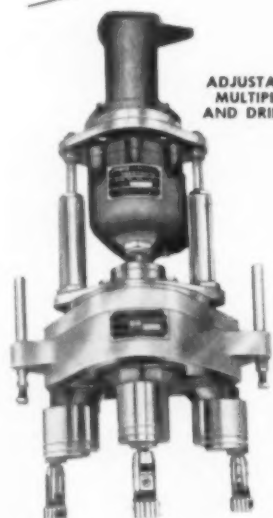
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MULTIPLE TAPPING
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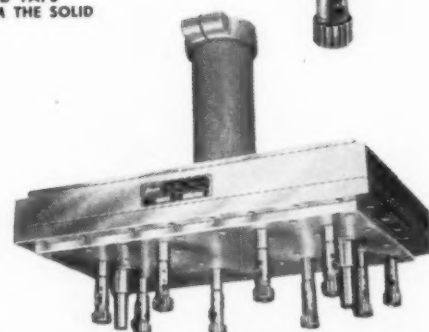
TORQOMATIC
TAPPING
ATTACHMENTS



HIGH SPEED TAPS
GROUND FROM THE SOLID



TORQOMATIC
TAPPING
ATTACHMENTS



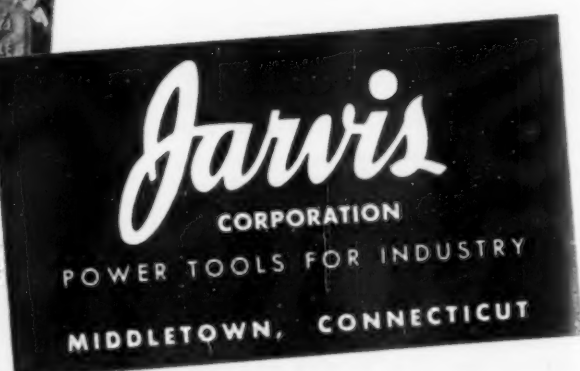
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MULTIPLE DRILLING
AND TAPPING HEADS



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MACHINES AND
FLEXIBLE SHAFTS



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CATALOGS TODAY



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CORPORATION
POWER TOOLS FOR INDUSTRY
MIDDLETOWN, CONNECTICUT

Miscellaneous Equipment

(continued)

rows in one instance, and 4 rows in another—for small items which can be built brickwise against a wall to form a utilitarian partition between work areas. The drawers come in a variety of sizes and, because of planned interchangeability, can be of a single size or of different sizes in the same unit cases. Dimpled bottom and top at all four corners, the cases can be fitted snugly one on top of the other and bolted into a strong, stable wall.

Tiny lock fasteners, called Flexloc micro nuts, are designed primarily for instruments and electronic devices. These fasteners, made in brass and aluminum, either plain or cadmium-plated, come in sizes 0-80, 1-64, 1-72, 2-56, 2-64, 3-48, 3-56, 4-40, and 4-48. Of one-piece, all-steel precision construction, they operate as a stop nut as well as a locknut, and remain locked regardless of vibration. They can be removed and used repeatedly without loss of locking effectiveness. **T-9-2431**

An automatic riveter for simultaneously setting a solid and a tubular compression rivet has been developed by Chicago Rivet & Machine Co.

In this unit two rotary type rivet hoppers are used, one to feed solid, the other, tubular rivets. The solid rivets

drop by gravity in the raceway to riveting position. The tubular rivets are fed to the pneumatically operated traverse slide which accurately positions the rivet directly below the solid rivet. Parts to be riveted are loaded on the tubular rivet. When the machine is operated, both rivets are wedged together in a single operation.

T-9-2432

Balemaster Div. of East Chicago Machine Tool Corp. has developed a lightweight, portable, hydraulic, scrap metal baler for volume fabricators of light-gage ferrous and nonferrous materials.

The unit is capable of compressing contents of the 8-cu ft charging com-



partment into a briquette 12 by 12 by 12 in., which may weigh up to 120 lb. No pit is required for this machine which will bale scrap and trimmings up to 54 in. in length.

Because it occupies relatively little floor space, it can be located at the source of scrap or trimmings. It is 12 ft, 3 in. long, 14 in. wide and 67 in. high. Charging compartment door, bale ejector and bale compressing ram are all hydraulically operated. **T-9-2434**

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Cooper Weymouth, Inc. have introduced 6 and 12 in. air operated open throat slide feeds for power press operation. They hold to high accuracy while providing easy setup and adjustment. The units are available in five sizes in feed lengths up to 36 in. long and up to 18 in. wide on mechanical and hydraulic presses. They can be set to feed from either side or from front to back or back to front of presses.

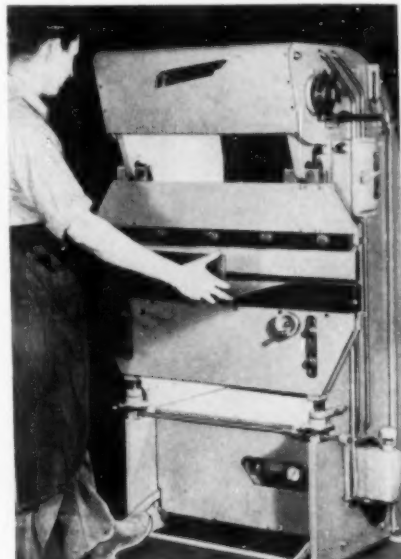
T-9-2435

A second press brake announced by O'Neil-Irwin is the Di-Acro hydraulically operated Hydra-Power unit which develops 12 tons of pressure. It has a 36-in. length of bed and ram.

Main advantage of this machine is stroke control. Most practical length of stroke for each job can be preset, and the ram can be stopped or re-

versed at any desired point in a work operation.

Power is applied to a rotary hydraulic cylinder which is mechanically linked to the camshaft. A bending cycle is completed in the forward movement of the hydraulic cylinder and another cycle is completed in the re-



turn movement. An adjustment of the stroke control selector gives the proper stroke length without having to readjust the bed or die settings.

A 24-in. hand-operated Di-Acro press brake rated at 8-ton capacity is announced by O'Neil-Irwin Mfg. Co.

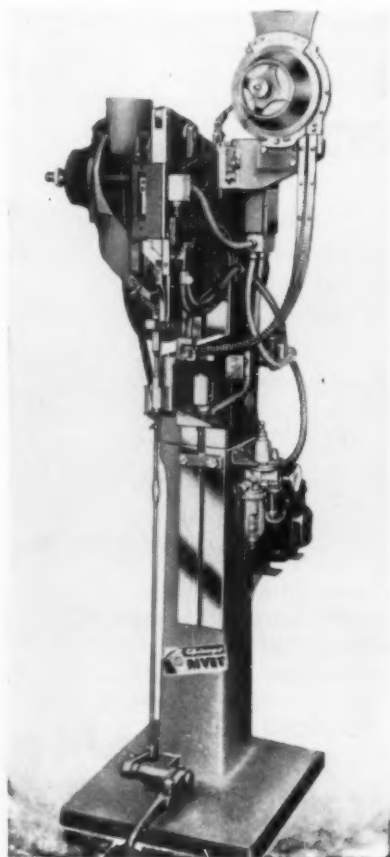
It incorporates a special cam lever mechanism which provides power for forming, blanking, piercing, drawing and trimming operations plus a ratchet drive system that multiplies the power for heavy forming jobs.

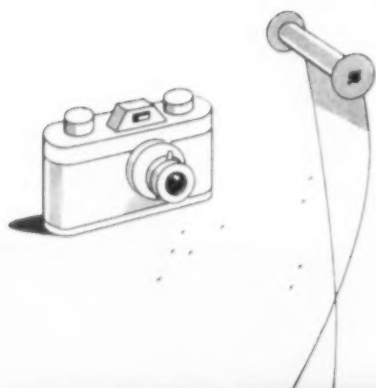
The brake will form 16-gage mild sheet steel across the full 24-in. forming width, and 10-gage mild sheet steel across a 12-in. forming width as well as many types of ductile materials.

T-9-2436

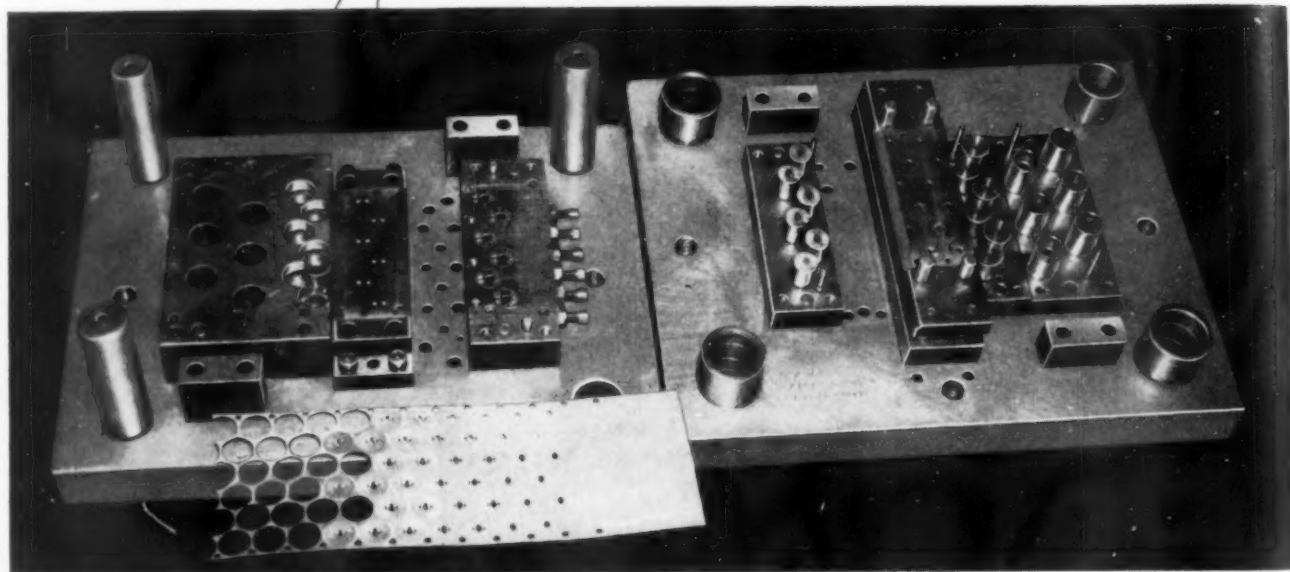
Barrel deburring, descaling and derusting may be accomplished with a new compound developed by Oakite Products, Inc. This mildly acidic material, FM 184, was created specifically to replace raw acids in barrel operations where alkaline materials and abrasives are impractical because of time limitations. It also improves color of steel after alkaline deburring, removes heat scale from steel and brightens brass when used with or without abrasive media.

FM 184 may be added dry to the burnishing barrel. At concentrations of 1 to 3 oz to a gallon of water, it has good foaming properties. **T-9-2437**





Over 150 Million Stampings from this **ONTARIO** Die



600,000 Film Spool Flanges PIERCED, EMBOSSED, STAMPED and BLANKED per Grind



Production engineers at an eastern camera manufacturing plant have reported excellent results from their Ludlum Ontario film-spool-flange die. The Ontario die performs the multiple operations of piercing, embossing, stamping, and blanking.

Operating at 130 strokes a minute, the big die has produced over 150,000,000 parts. Runs as high as 600,000 have been made between grinds. For this operation, Ontario is air cooled from a temperature of 1850 F, then tempered at 350 F for six hours. This results in a Rockwell C hardness of 60-62.

Ludlum Ontario is an air hardening die steel of the high carbon/high chromium type. It has all the desirable properties of such steels—resistance to abrasion, high hardness and excellent non-deforming characteristics. In addition, it is tougher but easier to machine than the higher carbon/high chromium types which are usually oil hardening.

For the finest in tool steel to help solve your cutting, forming, or blanking problems, call your nearest A-L office or distributor today, or write *Allegheny Ludlum Steel Corporation, Oliver Building, Pittsburgh 22, Pennsylvania.*



Write for your **ONTARIO BLUE SHEET**

A concise 4-page booklet of facts on the handling and shop treatments of Ontario. Included is complete information on forging, annealing, tempering, etc. and detailed laboratory data on physical characteristics. Ask for your free copy.

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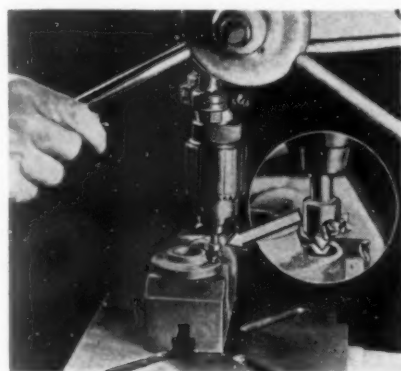
TOOLS of today

Many new tools and equipment items have been developed which may not be exhibited at the September shows in Chicago, but which are of equal interest to tool engineers. Representative machines and components from these developments therefore are described and illustrated in the following pages of Tools of Today.

Countersink

An unusually designed solid carbide countersinking cutting tool has a flattened noncutting edge higher than the cutting edge, which is on a rounded dip. A round chip clearance hole centered in the cutting edge allows a smooth flow of chip waste. Because of this construction, there is no chatter or vibration, and cutting is exact in one sure effortless operation.

The countersink has an 82-deg included angle and is available for screw



size Nos. 5, 6, 8 and 10. Larger sizes, $\frac{1}{4}$ in. up to $\frac{1}{2}$ in., can be ordered with or without a pilot to fit any diameter needed. Recommended speed is 250 to 500 rpm.

The tool is licensed for manufacture by Raymac, a division of Dexco Corp., 15490 Dale Ave., Detroit 23, Mich.

T-9-2451

Tool Holders, Adapters

A line of tool holders and adapters designed to cut tool changing times to fractions of seconds, is announced by Universal Engineering Co., Frankenmuth, Mich. With the new Geni holders and adapters the spindle need not be stopped to change tools. This virtually gives a multiple spindle range to a single spindle machine. The Geni



holder consists of a combination body and shank, a locking ring, two steel balls and retaining rings. Operation is also simple. The Geni holders and adapters, which are self-centering, provide an accuracy which makes drilling and reaming of holes possible without a pilot bushing on many applications.

T-9-2452

Variable Speed A-C Motor

An a-c motor capable of running at variable speeds and ranges, is being manufactured by Bogue Electric Mfg. Co., 52 Iowa Ave., Paterson, N. J.

The Bogue N-S variable-speed a-c motor has no gears or mechanical means of power transmission; electric controls have been substituted for mechanical drives.

The N-S motor can be equipped with completely automatic, semiautomatic or manually operated controls. High efficiency is maintained under conditions ranging from sudden stops to reversing or inching. The motor can provide from 0.5 to 1000 hp with a speed ranging from 30:1 to 1.5:1. It is designed to operate on three-phase a-c power of 50, 60 or 400 cps.

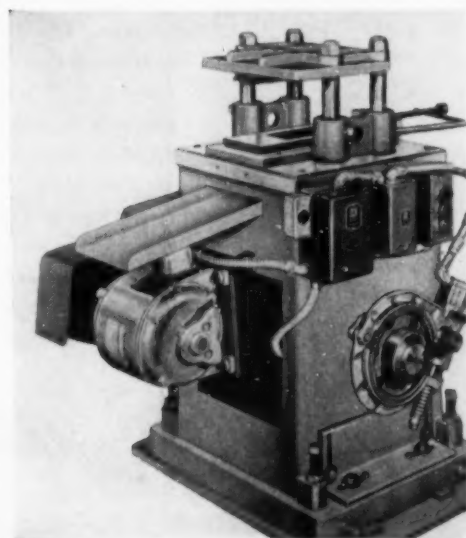
It is adapted to high starting torque loads.

T-9-2453

Flying Cutoff Press

Accurate high-speed production on cutoff of roll formed metal shapes is possible with the high-speed flying cutoff press designed by Dahlstrom Machine Works, Inc., 4225 W. Belmont Ave., Chicago 41, Ill.

By using coil stock instead of cut lengths, it permits considerable econ-





Men would not accept either idea at first . . .

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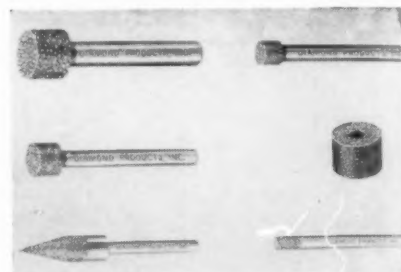
only by reducing the amount of scrap and producing more uniform shapes.

Operating speeds of the unit are 240 or 300 rpm, with capacities from 4 to 120 tons.

The press offers flag trip or positive mechanical run-out table to suit requirements. Height and lateral requirements are easily adjusted. Mechanical clutch is provided on 4-ton units, and an air clutch with an air brake on 8 to 120-ton units. **T-9-2461**

Diamond Impregnated Wheels

Crushed diamonds are imbedded in a special carbide matrix to make the Vinoy diamond impregnated wheels introduced by Diamond Products, Inc., 335 Prospect Ave., Elyria, Ohio. Designed primarily for the carbide die industry for grinding carbide dies, bushings, etc., these tools may also be



effectively used on other hardened materials such as nitrided or case-hardened steels.

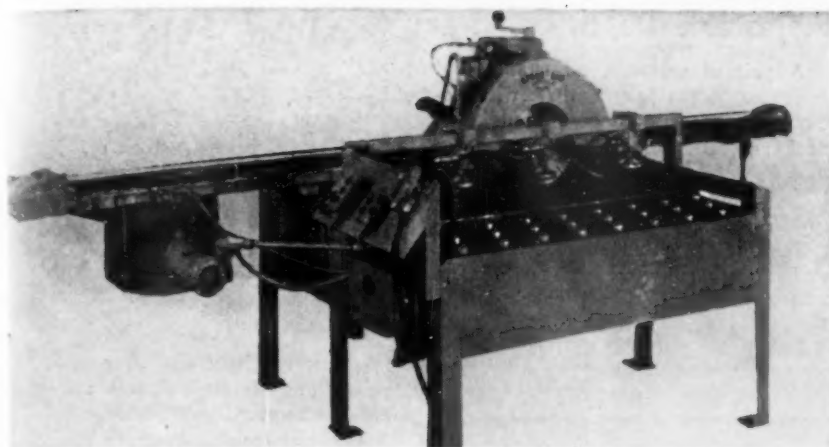
Wheels are furnished standard in an 80 diamond mesh but are also available in ranges from 60 to 200 mesh. When worn down, the diamonds are re-exposed in a bench lathe using No-220 grit silicon carbide abrasive with a flat cast iron lap. This procedure abrades the matrix and causes the diamond particles to again protrude. **T-9-2462**

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Cutting Machine

A traverse type-cutting machine for cutting plate and sheet stock of ferrous and nonferrous metals, has been introduced by the Stone Machinery Co., Inc., Manlius, N. Y.

This new model, the SS-20LR, has a locking roller assembly which locks it to a special channel type rail, providing greater rigidity and control over the cutting job and assuring longer wheel life with less breakage. In climb cut-



ting, all chips, dust and sparks are quickly disposed through the slot in the table, giving the operator a clear view of his line of cut.

The SS-20LR uses the latest type abrasive wheels in the cutting of ferrous metals, and a circular steel saw blade in cutting of nonferrous metals or nonmetallic materials such as plastic, melamine and masonite.

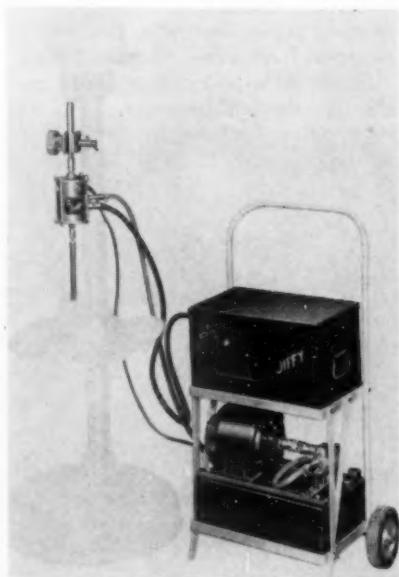
An oil mist spray may be directed at the point of contact between blade and material to provide better lubrication of the steel saw blades when cutting

nonferrous metals. As the machine can cut both away from and toward the operator, there is no need for adjusting the machine to a conventional starting position after each cut.

The SS-20LR can cut 1/4-in. stainless steel plate 4 ft long in 30 sec; 1/4-in. aluminum plate, 49 1/2 in. long in 9 sec; 1-in. melamine stock at the rate of 100 sq in. per minute; 1 1/2 in. laminated plastic at the rate of 10 sec per foot. In all cutting, this machine is engineered to hold tolerances to 0.010 in. **T-9-2471**

Metal Disintegrator

A low-cost metal disintegrating machine featuring fast, efficient operation without the use of electronic tubes,



rectifiers or condensers has been developed by Jiffy Disintegrators Inc., 109 E. Nine Mile Rd., Detroit, Mich. It removes broken taps, drills, etc., quickly and completely. **T-9-2472**

Hardenable Stainless Alloys

A series of four corrosion resistant precipitation hardenable stainless steel alloys has been announced by the Research Div. of Cooper Alloy Corp., Hillside, N. J.

PH55A is a high-strength high-hardness alloy with fair ductility, for erosion and abrasion resistance or for stressed parts in corrosive applications. PH55B is a ductile high-strength alloy of medium hardness, for shock resistance and high stresses in corrosive applications. PH55C, a very high hardness alloy, has low ductility for non-stressed, corrosion resisting parts. PH20 alloy is gall resistant and has superior corrosion resistance.

All three alloys in the PH55 series are variations of the 19 percent chromium, 9 percent nickel analysis. Variations in hardness and ductility are achieved by introducing and varying molybdenum, copper and silicon, and controlling the carbon below 0.08 percent and the manganese below 1 percent. The corrosion resistance of these three alloys equals or surpasses that of type 316 stainless. Average Brinell hardness for PH55A, B and C is 341, 293 and 415, respectively.

Type PH20 is a precipitation hardenable version of the 20 percent chromi-

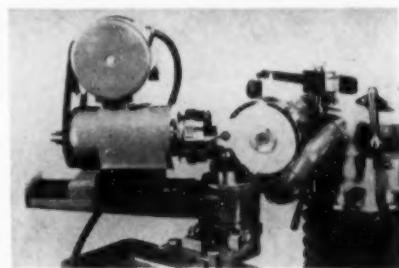
um, 29 percent nickel type 20 alloy which has unusually good resistance in hot sulphuric acid and superior resistance to a long list of corrosive solutions. It achieves average Brinell hardness of 229 as compared with 130 B.H.N. for the standard 20-type alloy. **T-9-2473**

Ball Grinder

A Swedish-crafted Jungner ball grinding attachment is used on surface or tooling-grinding machines to grind spherical plug gages, balls on shaft ends and most types of circular work.

Setting up for grinding is accomplished with the unit's built-in diamond set-up gage and any standard gage blocks.

The Jungner unit available from Nife Inc., Copiague, N. Y., is supplied



with a precision 3-jaw chuck with a repetitive accuracy of 0.0001 in.

Spherical capacity is 2 1/2 in. diameter, while capacity of chuck is from 1/16 to 3 in. Maximum shaft capacity is 8 x 5/8 in. Taper hole in workhead spindle is #4 Morse. Extra equipment, such as reducing sleeves for standard taper, spring collets and collet pads is available. **T-9-2474**

Cut-Off Wheels

Abrasive cutting-off wheels using fiberglass fabric as reinforcement and with a high safety factor at operating speed up to 16,000 sfm are being made by the Carborundum Co., Niagara Falls, N. Y.

Besides the high-speed safety of these wheels, their longer operating life also helps lower production costs.

These wheels, employing aluminum oxide as an abrasive, are used for rough grinding, weld removal, cut-off and slotting operations on ferrous and nonferrous metals. Silicon carbide wheels reinforced with fiber glass fabric are used on non-metallic materials, including plastics reinforced with fiberglass fabric.

Laboratory tests indicate that rigid wheels have a bursting speed of up to 40,000 sfpm., a flexural strength index

of 7,000 and an impact strength rating of 400 ft-lb per sq in.

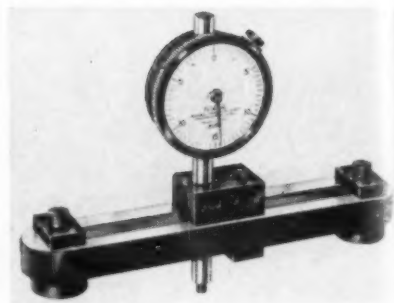
Grinding surface of the new wheels maintains peak efficiency at high speeds and resulting high surface temperatures. Since fiberglass is a ceramic material like the abrasive, it wears away evenly at almost the same rate. Also, it retains its great tensile strength without charring or melting.

They are available in standard thicknesses of $\frac{1}{8}$ to $\frac{3}{8}$ in. and diameters of 2 to 20 in. **T-9-2481**

Adjustable Depth Gages

A pair of versatile, adjustable dial indicator depth gages that will accurately gage a variety of conditions such as slots, holes, recesses, grooves and keyways, are being manufactured by Federal Products Corp., 1144 Eddy St., Providence, R. I.

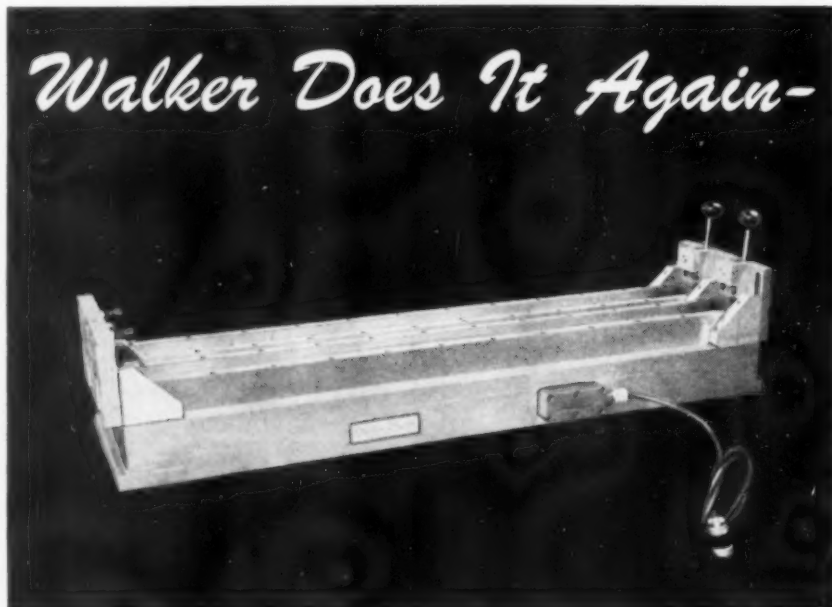
Suitable for either general shop use or final inspection, these gages, Models 75 P-10 and 75 P-11, will check depths from 0 to 1 in. and from 1 to 2 in.,



respectively. Specially shaped contact points and longer contacts are available on request.

The cushioned movement dial indicator is easily adjustable vertically within the capacity of the gage and may be locked in position. An auxiliary plunger, which relays the measurement to the indicator spindle, protects the spindle from eccentric loads and is keyed to prevent rotation while gaging.

Rest pads, adjustable horizontally, are 1 in. in diameter and may be adjusted from $2\frac{1}{4}$ in. to 6 in., center to center. The dial indicator is also adjustable horizontally and may be located anywhere between the rest pads or, for overhang condition, may be set outside the pads. Regardless of the position of the gage, the indicator may be turned to any direction for clear visibility. **T-9-2482**



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O. S. WALKER CO. Inc.

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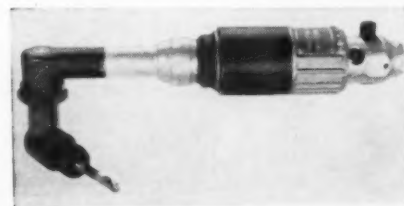
Original Designers and Builders of Magnetic Chucks

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-248

Angle Head Drills

Two new series of heavy-duty angle drills, for drilling in confined or obstructed areas, are being produced by Buckeye Tools Corp., Dayton, Ohio.

Rated at $\frac{1}{4}$ -in. capacity, these portable air-powered drills are offered with either 90 or 360-deg angle heads. Drilling at any angle is possible be-



cause 360-deg heads can be locked in any position within full circle. Low tool head height and lack of any exposed moving parts are design features.

Both series of drills are available in lever or lock button throttle models, in a choice of seven speeds between 3500 and 300 rpm, and with $\frac{1}{4}$ in.-28, $\frac{5}{16}$ in.-24 or $\frac{3}{8}$ in.-40 spindles. Optional equipment includes Buckeye Cone-Jaw chuck and choice of collets. **T-9-2483**

Multiple Outlet Gear Pump

Nathan Mfg. Corp., 45-02 Ditmars Blvd., Long Island City 5, N. Y., has introduced a multiple outlet gear pump, Model Z3U, available with from two to six outlets. An automatically controlled divider device enables each outlet to deliver an exact quantity of lubricant independent of the prevailing back pressure.

A single pair of special design gears provides precision operation with minimum power consumption. Pumps are made in different sizes and delivery of the outlets can be equal or each one can be designed for a different quantity. The pump illustrated is a three-outlet model and measures $3\frac{3}{4} \times 3\frac{1}{4} \times 2\frac{1}{2}$ in. Model Z3U can also be supplied with reversible drive for operation in both directions. Reversible valves



or flaps are not used in this model; therefore proper operation is assured when either pure or impure liquids are used. **T-9-2491**

Surface Grinder

A semiautomatic Lewis No. 1 billet surface conditioning grinder that will handle billets from $2\frac{1}{2}$ in. square up to 6 in. square by 8 ft long has been introduced by the Lewis Machinery Div. of the Blaw-Knox Co., Farmers Bank Bldg., Pittsburgh, Pa.

Initial tests on an experimental model billet grinder indicated that up to six times as much work could be done with this machine as with a conventional hand-operated swing grinder.

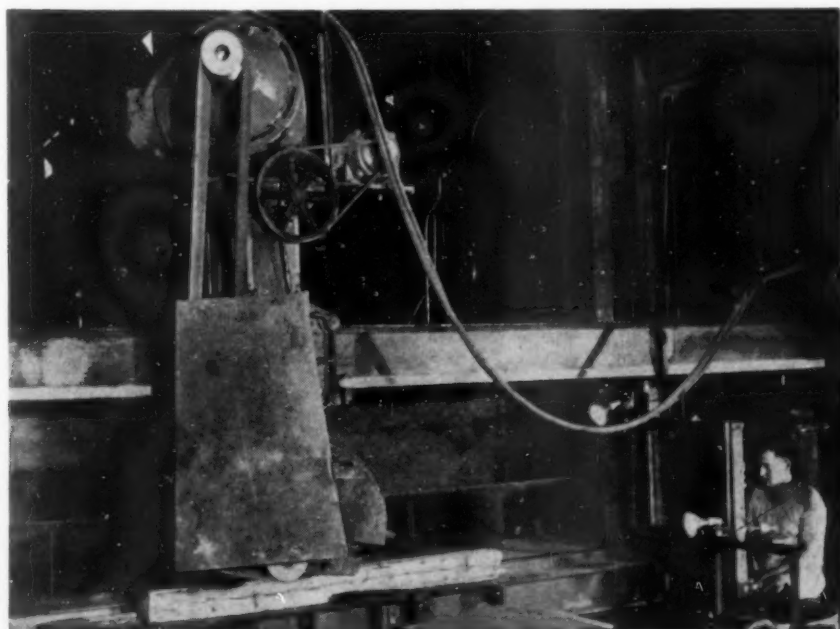
A prime reason for the increase in production is billet handling. Billets are placed on skids by crane operators; from them they are machine handled, controlled by an operator seated in the safety-glass-protected pulpit.

Because of the automatic features,

operator fatigue is minimized. The grinder is designed to exert its own continuous and uniform downward pressure. Amount of this pressure is adjustable.

The amount of stock removal can be varied. The grinding wheel of the machine is set at about a 30-deg angle to the work, giving a wider surface of contact per pass and enabling the 20-in. diameter, 4-in. face wheel used to climb back up on the work after it passes off the end of the billet.

This unit is powered by a 40-hp motor. Travel is obtained through a gear reduction unit and integral fluid coupling powered by a $1\frac{1}{2}$ -hp a-c motor. While the distance of travel on the Lewis No. 1 is standardized for 8-ft billets, other models can be built to customers' specifications. **T-9-2492**



Lapping Machine

Fast automatic lapping to precise, superfine finishes on small and medium parts is possible with the Gyromatic "21" lapping machine developed and manufactured by the Spitfire Tool Co., 2931 N. Pulaski Rd., Chicago 21, Ill.

An adjustable, figure-eight motion is incorporated in the unit, which is on a push-button basis, to simulate the movement of hand lapping. Parts are positioned by laminated thermosetting plastic nests inside specially designed, close-grained cast iron gear retainer rings. After being quickly positioned by the unit, parts are rotated clockwise by a special innovation against the counter-clockwise rotation of the lap-



ping plate. Parts removal, as well as insertion, is fast and easy.

The Gyro-Matic "21" is equally adaptable for either manual or automatic operation. For convenience of handling, the unit's abrasive compound tank can be disengaged for cleaning. A built-in agitator keeps abrasive grit and vehicle constantly in correct suspension. All moving parts in the gear box are permanently sealed and lubricated, and only electrical controls are used. **T-9-2493**

Knurling Tool

A hand knurling tool, announced by Rockwin Mfg. Co., 45 Rose St., New York, N. Y., is designed to save time on short production runs and on individual parts. Furnished with three standard hardened steel knurls, this tool, called the Knurlmaster, cuts a knurl on stock as small as $\frac{1}{8}$ in. diameter with no distortion. It has a knurling capacity up to 1 in. diameter. The hardened forged steel frame clamps over workpiece and automatically centers itself as workpiece rotates on lathe or drill press. Simply turning the handle causes a uniform



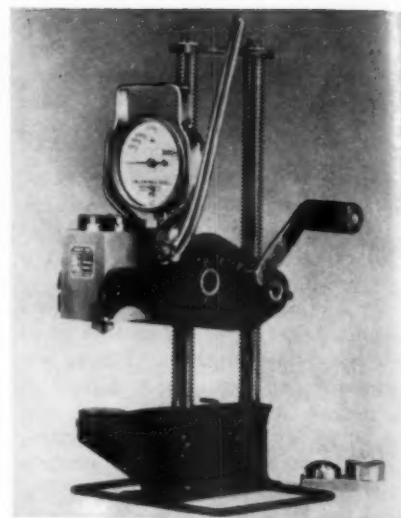
pattern to be cut over the entire work surface because of a special screw and locknut feature of the tool. The flat faces of the tool are ground so that they can be rested on parallels when using a drill press for knurling. The Knurl-master will also cut a perfect knurl pattern when work is held in a vise.

T-9-2501

Hardness Tester

Ferrous metals in regular and irregular shapes can be tested for hardness at the most convenient location with the portable Brinell hardness tester developed by Andrew King, Box 606, Ardmore, Pa. It can be used in any position, including inverted. The light, rugged King portable puts a load of 3000 kg on a 10-mm ball with intermediate loads as required. There are no test bars; the unit makes a single, easily read impression. Vibration does not affect accuracy of tests, which are guaranteed within ASTM requirements.

It is especially adapted for testing immovable parts and assembled parts in machines. The narrow, shallow nose at the anvil and the recessed base permit the user to make tests in small, cramped spaces, tubes and cylinders.



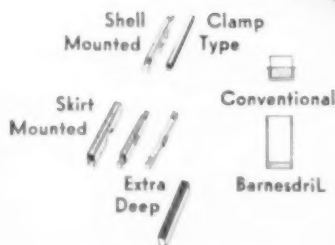
The tool's removable test head makes it possible to test parts of any size, anywhere.

The test head out of the base can be held by any means capable of withstanding the 3.3-ton thrust of the ram on the ball.

T-9-2502



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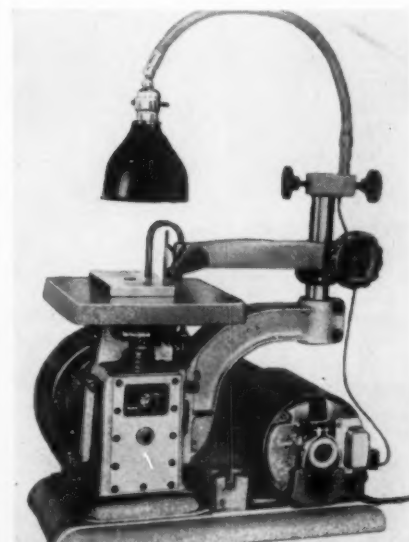
FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-250

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Die Cutting Machine

All American Tool & Mfg. Co., 8027 Lawndale Ave., Skokie, Ill., has added the low-cost Model 875 to its line of precision die filing, sawing and honing machines.

The mechanism which works the file, saw or hone up and down vertically is the same scotch yoke-type reciprocating unit as used on the company's more elaborate models 1500 and 1500-S. Tool



travel is $\frac{1}{8}$ in. at approximately 380 strokes per minute, providing fast, accurate operations.

The clamp, which holds the file or other tool, accommodates square or round shanks up to $\frac{3}{8}$ in. diam. A universal joint in the clamp permits the tool to be accurately adjusted vertically.

T-9-2511

Rivet Spinner

The High Speed Hammer Co., Rochester, N. Y., has added a motor-driven rivet spinner to its line of cold riveting machines and stakers. Available in both floor and bench models and designed for either foot or air



operation, this high-speed spinning rivet machine forms perfect rivet heads noiselessly. Rivet capacity is up to $\frac{1}{16}$ in. diameter, spindle travel is $\frac{3}{4}$ in. adjustable downward.

The air operated model is designed to avoid operator fatigue and assure uniform assemblies at every cycle.

T-9-2512

High-Speed Surfacers

Fenlind Engineering Co., 5602 Pike Rd., Loves Park, Ill., has released an ultraspeed surfer that offers greatly increased speed plus positive uniform pressure on the work regardless of shape, without expensive fixtures.

This Model 16 coated-abrasive, belt type unit is designed specifically for producing a true, finished locating surface on rough castings.

Speed and uniformity of work of the

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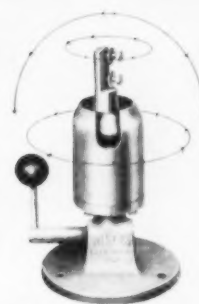
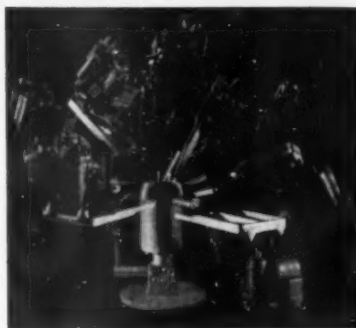
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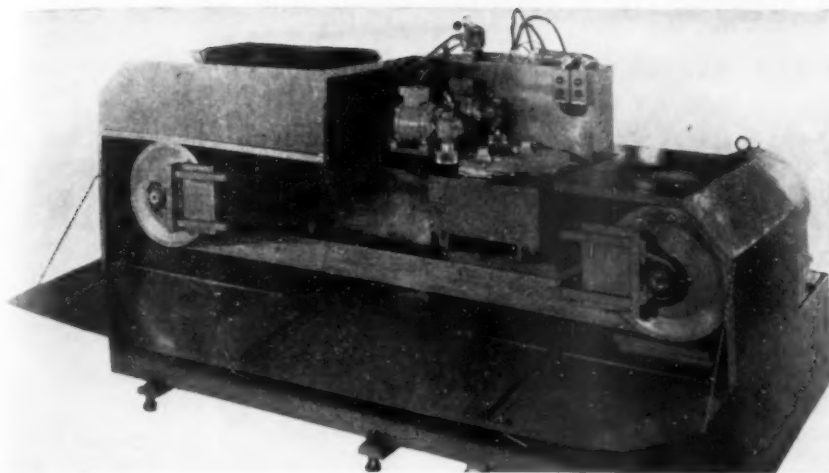
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Model 16 are due to a combination of its magnetic platen and a simple, positive work-holding-and-turning device. The work is held in position on the belt over the magnetic platen which pulls the work against the belt with a strong, uniform pressure. This pressure is adjustable from 0 to 185 psi, giving the

operator a choice of cutting speeds for all types of work.

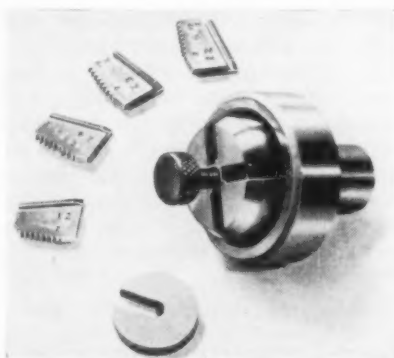
The work-holding fixture, cut to the shape of the casting, is designed to hold the piece against spindles, which rotate and oscillate the piece across the belt and assure absolute uniformity of grinding action.

T-9-2531

Relieving Fixture Attachment

Radial relieving of a complete set of collapsible tap chasers in one grinding operation is possible with an attachment developed for the R-O universal form relieving fixture by Royal Oak Tool & Machine Co., 29800 Stephenson Hwy., Royal Oak, Mich.

The attachment consists of a head with slots into which the chasers are



inserted. They are secured with a C washer turned down with a knurled screw. The assembly is then inserted in the collet and ground by regular procedures as though it were a solid tool.

With the method, which permits radial relieving of the chaser chamfer, all chasers have an identical chamfer and each will do its share of cutting.

T-9-2532

Multihead Riveters

The automatic multihead rivet setting machines produced by Tubular Rivet and Stud Co., Wollaston (Quincy) 70, Mass., consist of several individual basic machines, each mounted on a base and equipped for air operation. The number of basic heads, type of rivets fed and set, distance between centers and anvil elevations are all determined by the particular assembly for which each is designed. They may be altered, however, to meet changing requirements. Components to be fastened are put in a work-holding fixture by the operator. Rivets are then automatically fed and simultaneously set in each cycle. Some units set identical rivets but, by changing the feeding parts, up to 12 rivets of different specifications can be set at one time.

T-9-2533

High-Speed Clutch Controls

Fawick Airflex Div., Fawick Corp., 9919 Clinton Rd., Cleveland 11, Ohio, has developed a series of high-speed clutch controls for presses equipped with pneumatic clutch-and-brake. Compact in size and design, the units are easily adapted and installed on new or old presses to provide both accuracy of operation and versatility.

Three enclosure sizes are offered, all of which provide nonrepeat protection and the functions of inching, single stroke and continuous operation. Selec-

tion is controlled by the positioning of an exterior oil-tight selector switch. The small, basic control is designed to meet average requirements of a high-speed press. The medium size control may be equipped for timed-inching or with a Size 1 magnetic motor starter. The large size, which is built to conform to JIC and NMTBA standards, incorporates controls for press clutch and brake, Size 1 starter for press drive motor, and externally operated, cover-interlocked disconnect switch. Optional functions of hand-foot, semicontinuous, and timed-inching are all available on the large size panel.

The controls are available as individual units or as a component part of a low-cost package unit for conversion of presses to pneumatic clutch-and-brake.

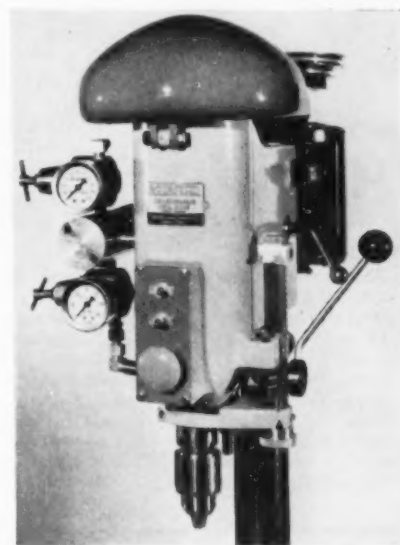
T-9-2534

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Air-Hydraulic Drill Head

An integral air-hydraulic drill press head has been announced by the Rota-feed Co., 2820 E. Grand Blvd., Detroit, Mich.

Users of this head have a choice of either completely automatic or manual operation. By shutting off air pressure and inserting a quickly attached drill



press handle, the tool is ready for manually drilling odd lot jobs.

Designed to operate on 30 to 40-psi air for average single spindle drilling operations, higher pressures can be used in multiple spindle drilling. Multiple spindle drilling is achieved without loss of stroke length when the drill head is attached to the extra long quill. A projection below the thrust plate

You can trim drawn shells like these in a single press stroke!

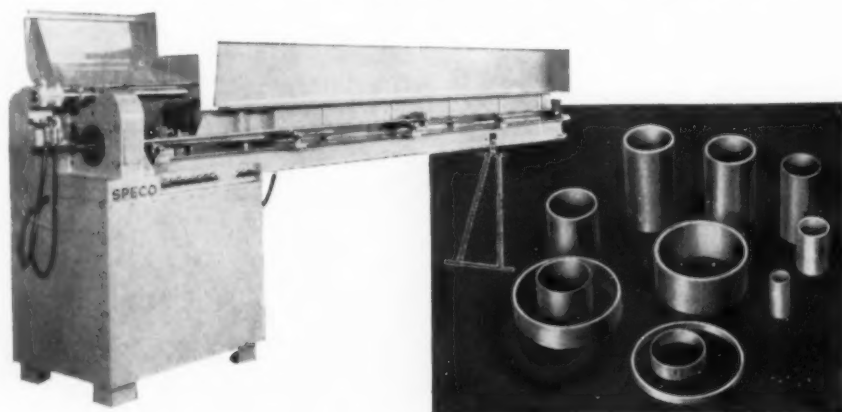


The Brehm "Shimmy" Die employs a radically new trimming principle . . . completely different from ordinary trimming methods. A cam action inside the die moves the shearing edges four ways—eliminating slow, costly "horn" and "pinch" trimming operations. You get a perfect edge finish every time . . . and a single die may be used for many different shapes. Production goes up fast. Production costs are slashed! Trims stainless and

mild steel, copper, brass, zinc, aluminum, gold, silver, fiber, rubber, plastics. Trims all sizes from fountain pen ferrules to refrigerator doors—in almost any thickness that can be drawn. Brehm Dies can be used in mechanical or hydraulic presses.

The NEW Brehm Trimming Press does all trimming in one press stroke . . . takes less power, trims shells up to 16 inches square, 6 inches deep, .125 inch stock—metals, plastics or fibers.

Up to 10,000 pieces in 86 minutes with the new Brehm tube cutter!



The revolutionary Brehm Tube Cutter has a cutting action that makes it the finest machine of its kind ever built! Cuts tubes $\frac{3}{8}$ " to $2\frac{1}{4}$ " O.D.—with production speeds ranging up to almost 7,000 pieces per hour! With the Brehm shearing action, there is no loss of stock—no burred tube ends! Up to 25% more pieces from the same length of stock. Cuts almost any tubing—mild steel, stainless steel, brass, copper, aluminum, etc.



permits clamping on the drill head.

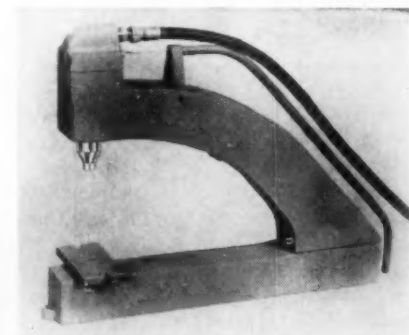
Other features of the Rotafeed head are the forward hanging pulley guard which makes belt changing readily accessible, the micro-depth adjustment by means of calibrated knob, and the rapid approach adjustment which is external and infinitely adjustable.

A simplified electrical control panel is constantly in view of the operator. The drill press heads are quickly, easily and economically installed on any round drill press column. **T-9-2541**

Fastening Tool

A lightweight precision machine, made by Jet-Heet, Inc., Pneumatic Tool Div., 152 S. Van Brunt St., Englewood, N. J., for use in production jobs that require impact or squeezing, delivers up to 200 spm.

This low-cost tool, called the Air Champ, efficiently staples, eyelets,



stakes, swages, crimps, stamps, marks, cuts and clamps. Throat depth is 10 in.

The complete production tool includes valve, bolster plate and foot treadle, ready to mount and use. Tools can be changed immediately without costly change overs. Economical use of air makes it possible for one $\frac{1}{2}$ -hp compressor, furnishing $1\frac{1}{2}$ cu ft of air per minute, to operate 8 Air Champs constantly, each delivering a working stroke every second. Mobile, versatile, easy to operate and store, the unit weighs only 12 lb. **T-9-2542**

Ram-Conversion Spindles

The Standard Electrical Tool Co., 2499 River Rd., Cincinnati 4, Ohio has produced a ram-conversion spindle for boring mills to provide versatility and economy.

Illustrated is a boring mill which has been converted into a vertical chucking grinder, the left-hand ram grinding an internal taper at the same time the right-hand ram is completing an OD grinding operation.

The precision motorized unit used is

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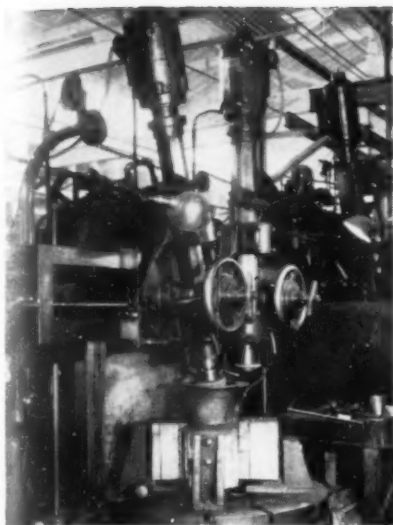
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directly coupled with the grinding spindle integral with the ram. A belted motor drive with variation in grinding spindle speeds also is available. To convert the ram for occasional grinding and metal cutting, a design is available which permits interchange of cutting tool holder with various sizes and lengths of grinding quills.

There is the option of a straight grinding wheel arbor, or taper nose with balancing type of wheel holders, both for internal and external grinding.

A ram-conversion unit is available for all makes and sizes of boring mills, as well as grinder attachment assemblies for independent mounting on ram or turret of the boring mill. **T-9-2551**

Insert Toolholder

Viking Tool Co., Shelton, Conn., has developed the Universatool to perform lead angle facing, lead angle turning in both directions, grooving, chamfering on both sides, and combination plunging and turning operations. The square throwaway carbide insert provides four sides with the positive rake holder.

Included in the holder design is the Viking fully adjustable chip breaker, replaceable carbide anvil, positive insert location, and indexability within ± 0.002 inches. **T-9-2552**



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Answer 2 Oakite has a new brass cleaner that provides scientific protection against the oxygen that tarnishes brass and other copper alloys during the application of reverse current. *See booklet offered below.*

Answer 3 Oakite has an anodic conditioner that offers brighter plating of zinc die castings . . . with no anodic blackening and fewer rejects. *See booklet offered below.*

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INDICATE A-9-256

Automatic Units for Drilling and Tapping

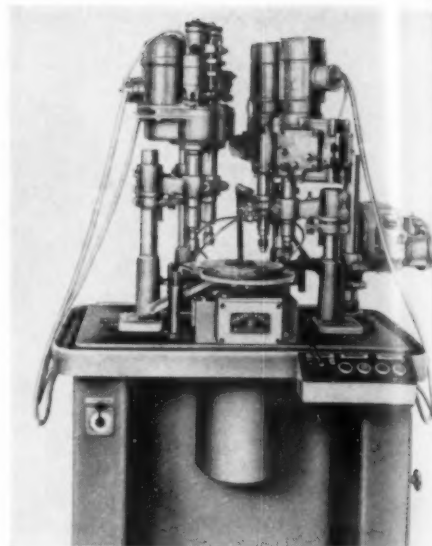
Automatic, high-production drilling and tapping may be accomplished with combinations of Variomatic equipment available from Donald C. Seibert, Wilmington, Del. The line, designed by Hahn & Kolb of Germany, includes three units: automatic indexing, drilling and tapping units. They are positioned on a pedestal to meet work needs. Utilizing the three components, special purpose machines may be easily built.

In a typical operation, workpieces are loaded by hand, and indexing of the work-holding plate, drilling, tapping and unloading of the finished parts take place automatically.

Cycle of the indexing plate can be varied by change gears from 5 to 55 in indexes per minute. Indexing time is about 0.3 second.

The automatic drilling unit is furnished with various transmission gears, according to the work for which it is to be used, to give spindle speeds ranging from 2000 to 11,000 rpm. Depth of stroke is varied by interchangeable cams.

The automatic tapping unit incorporates a 2-section spindle design to compensate for differences between pitches of the lead screw and the thread to be produced. For no-load



operation, spindle stroke is about 1 in. The unit is equipped with either a 1400 or 2800 rpm motor with either of two different gearboxes to permit selection of spindle speed. Spindle speeds possible are 500, 800, 1100 or 1600 rpm. **T-9-2561**

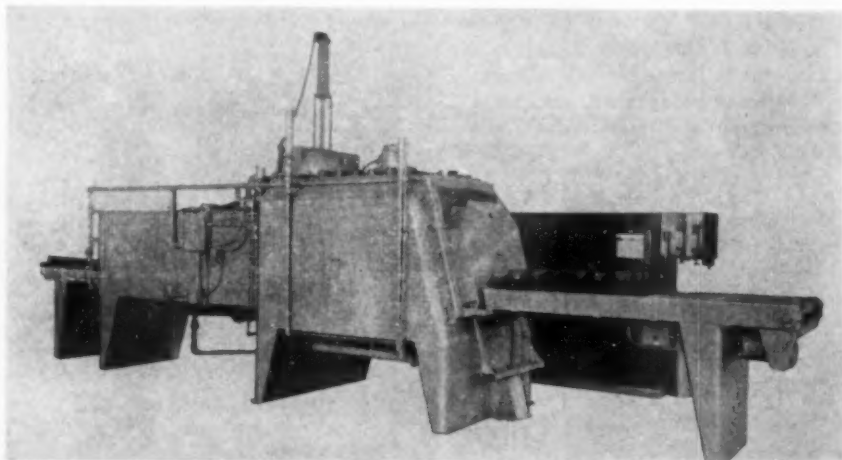
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213 TO REQUEST ADDITIONAL TOOLS
OF TODAY INFORMATION

Heat-Treating Units

Ipsen Industries, Inc., Rockford, Ill., has introduced three TFC Series heat-treating units featuring multiple cooling zones for air-cooling of work under protective atmospheres. Carburizing, carbonitriding, normalizing, annealing, stress-relieving, and brazing operations under complete atmosphere protection provided by the units, achieve bright scale-free work.

The units are classified at 400, 500, and 900 lb-hr at 1500 F. Maximum weight per charge is 600, 800, and 1400 lb respectively. Operating temperatures of 1850 or 2150 F are available.

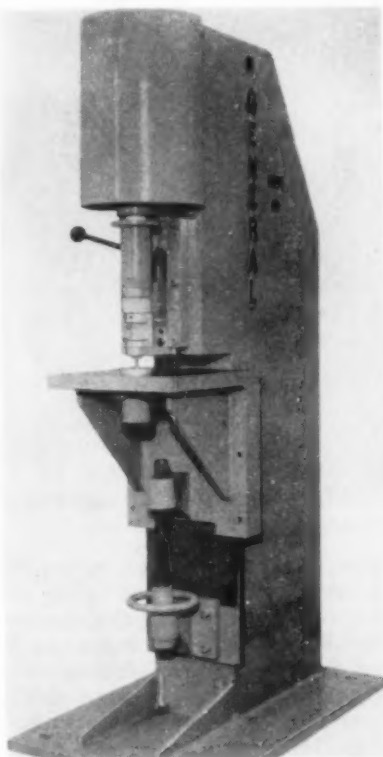
Furnace design is an adaptation of the forced convection heating principle pioneered by Ipsen. Also applied to the cooling zones, it provides scientific control of both heating and air-cooling cycles for exacting results even under high-production conditions. **T-9-2562**



Press for Bearing Assembly

General Riveters, Inc., 785 Hertel Ave., Buffalo 7, N. Y., announces a new press for the rapid assembling, sizing and accurate alignment of self-lubricated bearings in castings or other machined parts, in an automatic two-second cycle.

In operation, a bushing is placed on



a sizing arbor on the upper ram, while the workpiece is placed on the table. Bushings are inserted and sized and the arbor removed from the bushing in one automatic cycle. Loading time is less than 5 seconds.

Tooling, consisting of sizing arbor, stripper and pilot, is quickly changed for each bushing size. Bushing capacity is 1/4-in. diam to 1 1/4-in. diam by 3 in. long. Capacities may be altered to customers' requirements.

Press stroke is 6 in. with maximum force of 2000 lb with air pressure of 90 psi. Table height is adjustable.

T-9-2571

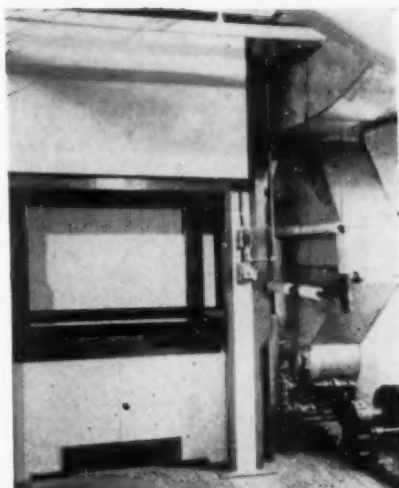
Dip Coating-Drying Equipment

Equipment to provide a two-dip system for the application and drying of a primer and a finish coat to small parts at a high-production rate is announced by Applied Engineering Associates, 1952 Flushing Ave., Brooklyn 37, N. Y. Coating produced is of uniform thickness, drain-free and tear-free. Drying is in a forced draft-

controlled atmosphere independent of ambient humidity and temperature. Angles and extraction speeds also are automatically controlled. This dip-coating technique can be used for the application of lacquers, enamels, paints or varnishes, as well as various types of plastic coatings.

The unit illustrated is 13 ft high and occupies 28 x 10 ft of floor space. Special chain attachments permit one operator to load and unload work carrying racks easily on the internal dual chain conveyor. Recirculation of coating materials in the tanks provides proper dispersion of pigments. Modification of the basic design principles to meet special applications can be readily set up.

T-9-2572



NEW GREAVES TOOLMAKERS OVERARM

Here's the way to add new "firepower" to toolroom milling operations! Install in your toolroom a GREAVES MILL equipped with this new Toolmakers Overarm.

You'll discover new versatility for milling intricate jig and fixture work, for keywaying, slotting and angular milling. Two graduated swivels permit mounting the spindle head in almost any angle for milling, drilling, spot facing and related operations.

Powered by an independent 2 HP motor, the unit is driven through helical gears. Eight speeds may be selected with convenient controls operating speed change clutches. A hand-fed quill attachment provides 4" tool travel to the spindle. Arbor support fits overarm, permits arbor type milling without changing overarm.

Write for Complete Specifications and Prices

GREAVES MACHINE TOOL DIVISION
J. A. FAY & EGAN COMPANY
2303 Eastern Avenue, Cincinnati 2, Ohio

- Swivels permit any angular setting of spindle head.
- 2 HP independent motor drive.
- 8 speeds from 175 to 1750 RPM.
- Quill has 4" hand feed.
- Spindle equipped with No. 50 N. S. taper; reduced to No. 2 Morse taper when Quill Attachment is used.
- Gears run in oil bath.
- Full vision oil level gauge.

RACK FEED. The overarm is equipped with rack feed for positioning over work.

BOOTH No. 721
National Machine
Tool Show

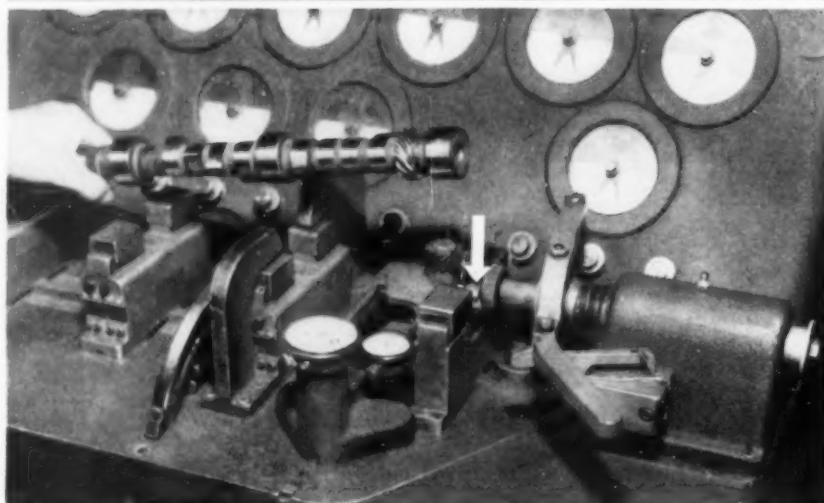
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F L P
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Design NEWS

News of Another Design Problem Solved With Flame-Plated Tungsten Carbide Coatings.



The master rolls of this camshaft gage (see arrow) have been Flame-Plated with tungsten carbide. Service life has been increased 32 times.

Flame-Plated gage rolls last 32 times longer

The short service life of master rolls in a special camshaft gage posed a knotty maintenance problem for a large automotive manufacturer recently. It was discovered that a groove would appear in the regular high-speed steel rolls after gaging 2400 pieces in the course of two days' operation. This situation meant that the rolls had to be changed frequently and, what was more important, the possibility of passing sub-standard parts was increased.

This problem was solved by having the steel master rolls Flame-Plated with a coating of tungsten carbide. The hard tungsten carbide coating resisted wear to such a high degree that no grooving was evident after 78,000 pieces . . . three months' work . . . had been passed through the gage. The result? Less down time and a high degree of accuracy over a long period of time.

Flame-Plating is LINDE's process performed in LINDE's plants for depositing a tungsten carbide coating on metal parts. Finished or semi-finished parts made of most metals can be Flame-Plated without distortion as the temperature of the part being plated does not exceed 400 deg. F. The coating may be used in as-coated condition (similar to fine emery paper) or ground to a fine finish.

For the full Flame-Plating story, call your nearest LINDE office today or write for your free copy of the Flame-Plating Booklet.



design with Flame-Plating in mind

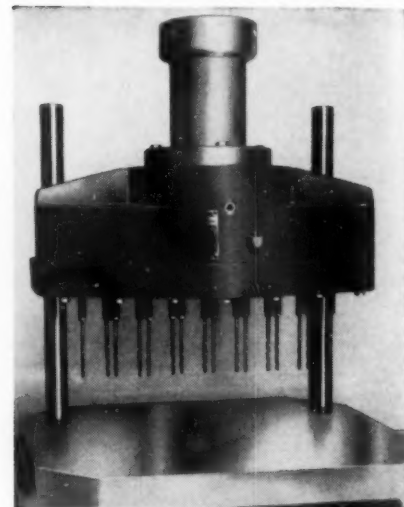
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A DIVISION OF UNION CARBIDE AND CARBON CORPORATION
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In Canada: LINDE AIR PRODUCTS COMPANY
Division of Union Carbide Canada Limited, Toronto



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Gearless Drill Heads

Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio, has introduced a series of In-Line drill heads to its line of standard gearless drill heads. The new series is for drilling, tapping or reaming holes in a straight line in an elongated pattern. As with



other heads, any diameter in any machinable material as close as the sum of the two smallest hole diameters can be drilled, reamed or tapped. Simultaneous multiple hole drilling in a straight line reduces drilling time and fixturing costs, as well as the number of machines required for some jobs.

Capacities of the new In-Line series are holes arranged in a straight line 13, 15, and 26 in. long. Drill sizes are 1/8 to 3/4 in. **T-9-2581**

USE READER SERVICE CARD ON PAGE 213 TO REQUEST ADDITIONAL TOOLS OF TODAY INFORMATION

Tapping Unit

A fully automatic lead screw tapping unit, Model TU-415, announced by the Wisconsin Drill Head Co., Butler, Wis., is especially designed for single or multiple spindle precision tapping on special machine. This compact assembly is completely self-contained and may be mounted in any position. As standard, it is furnished with a flanged quill and slotted spindles for close coupled multiple spindle tapping heads. The model TU is also available without the quill flange and with a 1-in. bore adjustable adapter spindle for single spindle tapping.

Protection against over-travel of the spindle is assured by limit switches located at each end of the quill travel.

The spindle stops instantly should the tap approach an undrilled location. Stroke length is fully adjustable from 0 to 4 in. and the dial control can be locked to prevent tampering.

The tap requires only a short setup time for changing the lead screw, spindle speed and spindle travel, and it can be completely reset in a few minutes. All standard lead screw pitches from 6 to 32 are available from stock.

T-9-2591

Metal Cleaner

A multipurpose alkaline compound that removes rust, scale, paint, grease, oil and other soils in one operation has been developed by Chemclean Products Corp., 610 Warren St., Brooklyn, N. Y.

The substance, called DU-AL #489, is noncorrosive to sound ferrous metals and can be used as a soak, or it may be used electrolytically with reverse or direct current. It prevents hydrogen embrittlement caused by acid descaling, and avoids the need for acid pickling in rust removal. With its use there is no acid disposal problem. It can be used in a mild steel tank.

T-9-2592

Semiautomatic Lathe

Several advantages incorporated in the Swiss-built Kummer Type MR 6020 precision semiautomatic lathe include dual-head arrangement to permit turn-

ing of intricate forms and faster machining time on production runs. The lathe automatically stops at the end of each cycle. During the operation of the first head the operator changes the workpiece in the stopped second head. Co-ordinate cam action insures precision control of the cutting tool.

The lathe works at speeds up to 3500 rpm. Capacity of the 2½ in. chuck can be increased with special devices. A complete line of attachments and accessories is also available. The lathe is distributed by Carl Hirschmann Co., Inc., 30 Park Ave., Manhasset, N. Y.

T-9-2593

Air Gage for Flatness

A rapid accurate method of checking surface flatness by means of air gaging has been developed by Federal Products Corp. of Providence, R. I.

This gage, Model A-582 B-4, has two essential parts: a Federal Dimensionair air gage, equipped with a universal air gaging spindle known as the AirProbe, and a Rahn, black granite surface plate. The surface plate used has an accuracy of 0.000050-in. for any 2 x 2-ft area.

The AirProbe, connected to the Di-

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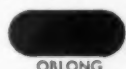
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ing of intricate forms and faster machining time on production runs.

Operation of the unit is simple. The operator loads the workpiece into the chuck actuated by a pedal. Depressing the starting handle engages the slide motion and spindle drive. The head

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Series "LW" Cast Head Air Cylinders—1" to 12" bore

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ensionair by a plastic hose which allows the dial to be placed where it can be conveniently read, is set into the center of the surface plate so that the contact point extends slightly above the surface.

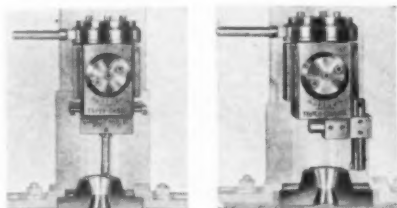
To check flatness, a part is placed on the surface plate and moved across the contact point.

AirProbes can be supplied in ranges of 0.003, 0.006, 0.015 and 0.030 in. The gage can also be used as a height or depth gage by the addition of special AirProbes. **T-9-2611**

Tapering Tool

Boring and turning both tapered and straight surfaces in either direction may be accomplished on the Chandler Taper-Champ, made by Chandler Tool Co., Muncie, Ind.

Rigidly constructed, it provides accurate, dependable service on jog bor-



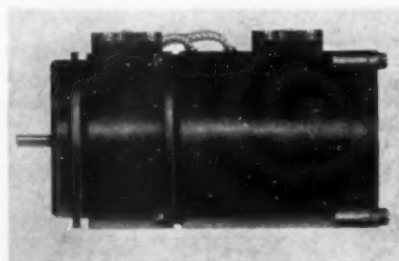
Taper-Champ is ready above left for boring; above right, for turning tapers.

ers, boring mills, etc., for producing blanking, piercing and drop-forge dies, and patterns.

Shanks are interchangeable so tool may be used in several different machines and are attached to tool body in a way to insure rigidity. The unit may be operated either vertically or horizontally. **T-9-2612**

Tachometer Feedback Unit

A low-cost, high-production miniature combination servomotor and a-c tachometer generator that operates on 60 cycles is available from Diehl Mfg. Co., Somerville, N. J. for regulating speed of a motor or for stabilizing closed-loop circuits. Both motor and the tachometer



generator are mounted on a shaft, thus preventing backlash and improving the stability of closed-loop systems.

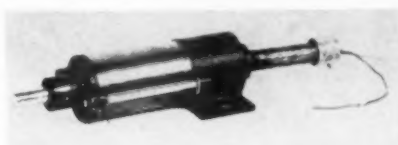
Five different gear reduction ratios (191.1 to 1, 76.6 to 1, 32.4 to 1, 13.8 to 1 and 5.8 to 1) make the Diehl unit suitable as either a differentiating or integrating component of analog computers, or as a component of recording and controlling instruments. Any one of the gear reduction ratios may be had in any of three motor ratings: 1, 5, or 10 watt output. Output of the motors is 5.5 volts per 1000 rpm with a linearity of 1 percent.

In-phase residual voltage of the tachometer is essentially zero because design of the unit permits ready adjustment of the unit after installation. **T-9-2613**

Power Cylinder

Power cylinders to convert a small electrical signal through use of controlled explosives, to lift and momentarily hold, various weights through a varied range of distances have been announced by Ordnance Material Div., Atlas Powder Co., Wilmington 99, Del. With lifting times measured in microseconds, they are adaptable to a wide variety of uses.

The Atlas OM-1A power cylinders use an OM-1B-700 replacement cartridge to lift and momentarily hold a 100-lb weight through a distance of



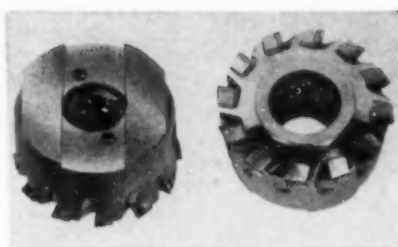
2½ in. in an elapsed lifting time of 82 000 microseconds.

Power cylinders can be activated at will and require little or no maintenance. As originally purchased the cylinders do not contain cartridges. These must be ordered in accordance with the requirements of a specific job. Inquiries should outline specific requirements such as space limitations, necessary force, required piston travel and approximate time for travel. **T-9-2614**

Boring Cutter

An inserted blade boring cutter designed so that all blade locking and adjustment mechanisms are totally enclosed during cutting has been developed by The Ingersoll Milling Machine Co., Rockford, Ill. Initially, the cutter is being used for rough boring in cast iron.

Although both locking and adjust-



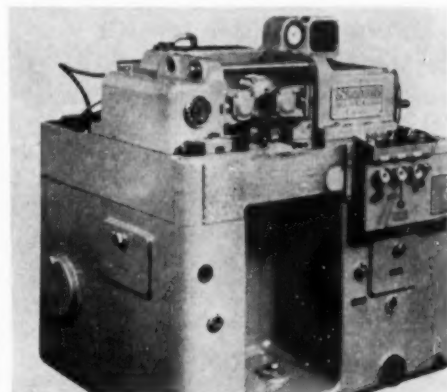
ing mechanisms are securely locked when the cutter is ready for use, they are readily accessible when the cutter is not mounted on the spindle.

Design of this boring tool makes it possible to increase the number of blades in small diameter cutters. Number is determined by feed rate, chip load and bore size and may vary from 6 to 12 carbide-tipped blades per cutter. **T-9-2615**

Thread Rolling Machine

An addition to its line of precision thread rolling machines, built entirely to American and British standards, is announced by Steidle Machine Co., New Britain, Conn.

Although it is designed for universal application, it finds special use for deep



rolling of such forms as Acme threads, large diameter coarse pitch worms, gear teeth, splines, rod lengths of various thread forms and for burnishing.

Forms as much as 30 percent stronger than those produced by cutting or grinding result from the Steidle rolling process. In addition, these hydraulically operated machines offer high-speed production and accuracy. **T-9-2616**

Grinder

A platen grinder has been developed by Curtis Machine Corp. in collaboration with the Carborundum Co., Niagara Falls, N. Y., resulting in increased



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262

coated abrasive belt life.

This grinder, the Curtis 91, employs a 175-in. long serrated contact belt behind a 226-in. long abrasive belt. The width of the belt can be varied in accordance with customer requirements. Present models use 4 to 8 in. widths.

The serrations on the contact belt flex the coated abrasive belt setting up a fast cutting action and greater chip clearance maintaining clean, cool, cutting efficiency. The serrated contact belt absorbs the friction against the steel platen and leaves the abrasive belt free to do its abrasive job. With this concept, finer abrasive grit belts can be used.

The Curtis 91 is equipped with three station tables, one on each side and one on the end of the machine. These tables are adjustable for angle grinding. **T-9-2621**

Toolholder

There is no need for carbide regrinding when this toolholder made by Wendt-Sonis Co., Hannibal, Mo., is used. Carbide inserts are firmly clamped in the hardened steel shank. When the cutting edge dulls, the insert



can be quickly and easily indexed or turned over. Eight cutting edges are available on square inserts.

Because a separate solid carbide chip breaker can be clamped on top of the insert, chip breaker grinding also is avoided. A replaceable shim under the insert protects the holder body in the event of insert damage. Steel or carbide shims are available with or without compound angles for inserts with neutral cutting rakes.

Inserts with formed clearance angles for neutral cutting rakes are available. Holders for throw-away inserts are available in five styles and several sizes for all left or right-hand turning, boring and facing operations. **T-9-2622**

Punch Shaper

Economy, versatility, and accuracy are combined in the Essex 32A punch shaper now being introduced in the United States by the International Machinery Div., Dept. TE, British Industries Corp., 164 Duane St., New York.

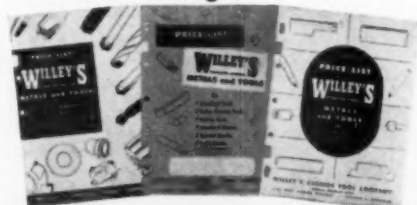
This punch shaper machines a blank-

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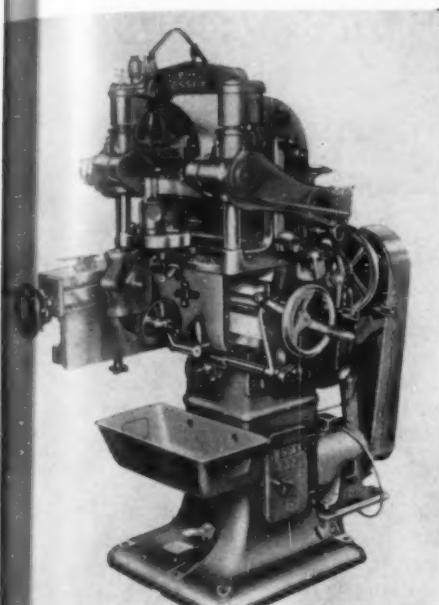
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The Tool Engineer



ing punch, hob, or profiled part directly from the solid in a single operation, using simple tools and operated by one man. With it, there is no necessity for making special punch holders or plates.

Normally, punches can be completely finished on the punch shaper in approximately half the time consumed by conventional methods.

Ordinary shaping tools are used in the unit. Stroke of the tool is like that of a conventional shaper set vertically, and is adjustable from 1½ to 4½ in. However, on the Essex 32A, upon completion of the predetermined straight stroke the rocker arm operates in a swivel motion, thus finishing the desired radius.

The prescribed shape can be laid out, or a template attached to the solid block of tool steel. The microscope attachment is then set directly above the work to assure precision reproduction.

A special feature of the machine is a special table shaping attachment, used for swivelling the dividing head from 0 to 15 deg toward the tool and 5 deg to right and left, so that the operator can put relief on punches or draft on hobs.

T-9-2631

Valve Heads

Hannifin Corp., 520 S. Wolf Rd., Des Plaines, Ill., has announced new solenoid heads for its "P-M" 3-way and 4-way Pilot Master valves developed to meet the JIC electrical recommendation for air cylinder control valves, that are electrically inoperative if a maintenance man should remove a solenoid cover and fail to replace it.

The Hannifin valves are supplied with solenoid covers die cast of zinc alloy and so gasketed that the valve

becomes splashproof and dust tight. Each cover is chained to the valve and is held in place by four "captive" screws which remain in their holes even if the cover is loosened. At the end of each cover is a manual operating button to provide manual operation of the valve without removing the cover.

Valves will be available in both Series "B" (3-way) and Series "BB" (4-way) designs and in all standard sizes from 3/8 to 1¼ in. ips. Single-solenoid and double-solenoid models are available in both series. **T-9-2632**

Angle Wheel Dresser

Vamco Machine & Tool, Inc., 1744 Main St., Pittsburgh 15, Pa., is manufacturing a combination angle and

wheel dresser designed to assure utmost accuracy in setting of the diamond. All settings of this dresser for emery wheels, called the Tang-A-Sine, are made by means of gage blocks instead of vernier calibrations. Use of a comparator is unnecessary when a center distance between two radii tangent to a common angle is desired.

All moving parts of this wheel dresser are protected from the abrasive action of emery dust by means of a neoprene bellows with resultant increased service life. A brass shoe on the set screw applies pressure evenly to the diamond shank holding it securely and preventing the set screw from marring the diamond shank.

Compact in size, the Tang-A-Sine measures 9¾ in. in length, 6½ in. in width and 6¾ in. in height. **T-9-2633**

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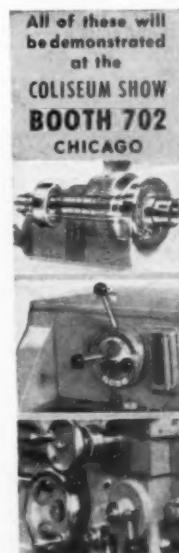
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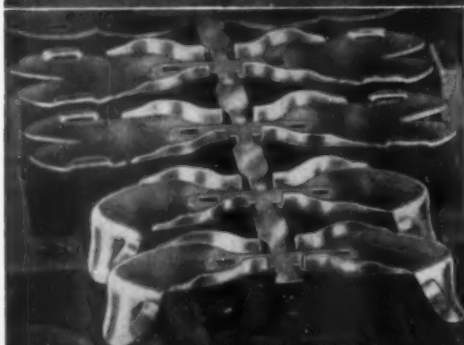
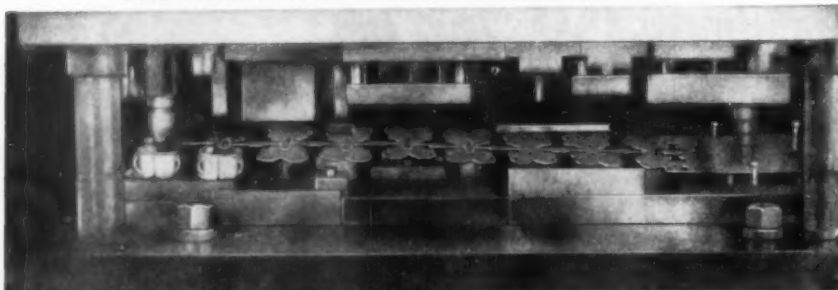
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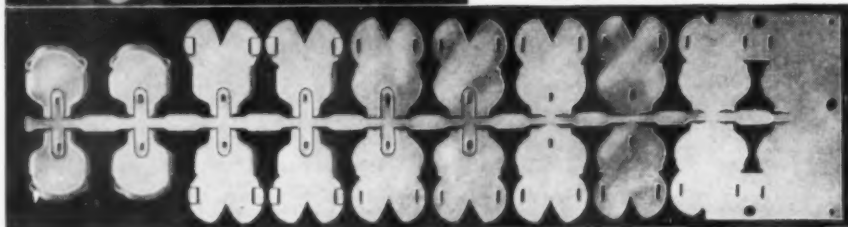
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Who's Meeting - and Where

Sept. 5-6. AMERICAN MACHINE TOOL DISTRIBUTORS ASSOCIATION. Annual meeting and exposition, Blackstone Hotel, Chicago, Ill. Request more details from association offices 1900 Arch St., Philadelphia, Pa.

Sept. 6-8. MATERIAL HANDLING INSTITUTE, INC. Fall meeting, The Greenbrier, White Sulphur Springs, W. Va. For additional facts write institute headquarters, 813 Clark Bldg., Pittsburgh 22, Pa.

Sept. 6-17. NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION. Machine Tool Show, International Amphitheatre, Chicago, Ill. Details concerning the exposition are available from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Sept. 6-17. PRODUCTION ENGINEERING SHOW, to be held in conjunction with the Machine Tool Show, Navy Pier, Chicago, Ill. Particulars may be had from show manager, Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Sept. 6-17. COLISEUM MACHINERY SHOW (formerly Metalworking Machinery & Equipment Exposition), Chicago Coliseum, Chicago, Ill. Write for details to Chester L. Wells, general manager, Exhibition & Convention Management, Inc., 2689 E. Overlook Rd., Cleveland 6, Ohio.

Sept. 12-16. INSTRUMENT SOCIETY OF AMERICA, 10th annual instrument conference and exhibit, Shrine Exposition Hall and Auditorium, Los Angeles, Calif. Details are available from exhibit manager Fred J. Tabery, 3443 S. Hill St., Los Angeles, Calif.

Sept. 14-16. PORCELAIN ENAMEL INSTITUTE, 17th annual Shop Practice Forum, Ohio State University, Columbus, Ohio. Further details on program plans are available from institute offices, 1145 Nineteenth St., N. W., Washington 6, D. C.

Sept. 15-18. PACKAGING MACHINERY MANUFACTURERS INSTITUTE. Annual meeting, Homestead, Hot Springs, Va. Complete details are available from in-

...ute office, 342 Madison Ave., New York 17, N. Y.

Sept. 20-22. SOCIETY OF INDUSTRIAL PACKAGING AND MATERIALS HANDLING ENGINEERS. Tenth annual Packaging & Handling Exposition, Kingsbridge Armory, New York, N. Y. For details, contact society offices, 111 W. Jackson Blvd., Chicago 4, Ill.

Sept. 26-29. ASSOCIATION OF IRON & STEEL ENGINEERS. Annual convention, Sherman Hotel, Chicago, Ill. Contact association office, 1010 Empire Bldg., Pittsburgh 2, Pa. for details.

Sept. 28-29. INDUSTRIAL ELECTRONICS CONFERENCE—1955, co-sponsored by American Institute of Electrical Engineers and the Professional Group on Industrial Electronics of the Institute of Radio Engineers, Engineering Society of Detroit Auditorium, Detroit, Mich. Further information is available from chairman of hotel and registration committee for the convention, Guido N. Ferrara, 8106 W. Nine Mile Rd., Oak Park 27, Mich.

Oct. 5-9. WORLD PLASTICS FAIR AND TRADE EXPOSITION, Los Angeles, Calif. For more information, write World Plastics Fair and Trade Exposition, 8762 Holloway Dr., Los Angeles 46, Calif., care of show management.

Oct. 6-8. SOCIETY OF INDUSTRIAL DESIGNERS. 11th Annual meeting and Design Conference, The Woodner, Washington, D. C. All details may be obtained from society office, 48 E. 49th St., New York 17, N. Y.

Oct. 17-21. NATIONAL SAFETY COUNCIL. 43rd National Safety Congress and Exposition, Conrad Hilton, Congress, Morrison and LaSalle Hotels. Details are available from council headquarters, 425 N. Michigan Ave., Chicago, Ill.

Oct. 24-26. AMERICAN STANDARDS ASSOCIATION AND NATIONAL BUREAU OF STANDARDS, joint sponsors of Sixth National Conference on Standards, Sheraton Park Hotel, Washington, D. C., to be held coincidentally with 37th annual meeting of American Standards Association. Write for details to ASA offices, 70 E. 45th St., New York, N. Y.

Nov. 1-5. WORLD SYMPOSIUM ON APPLIED SOLAR ENERGY, Phoenix, Ariz. sponsored by association for Applied Solar Energy, Stanford Research Institute and University of Arizona. Write for details to director of public relations at the institute, Stanford, Calif. Symposium will be preceded by a Conference on Solar Energy—the Scientific Basis to be held Oct. 31 to Nov. 1 at the University of Arizona, Tucson, Ariz.

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We invite you to consult with WILSON engineers on your hardness testing problem. There is no obligation. Write for Booklet DH-114 on WILSON "TUKON" Micro Hardness Testers.

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Testers**

Technical Shorts...

FAST ECONOMICAL precision casting of metals has been made possible through a technique developed by Corning Glass Works using glass molds. The Glascast process, particularly designed for work with high temperature alloys, results in fine sur-

Metal Casting by Glass Molds

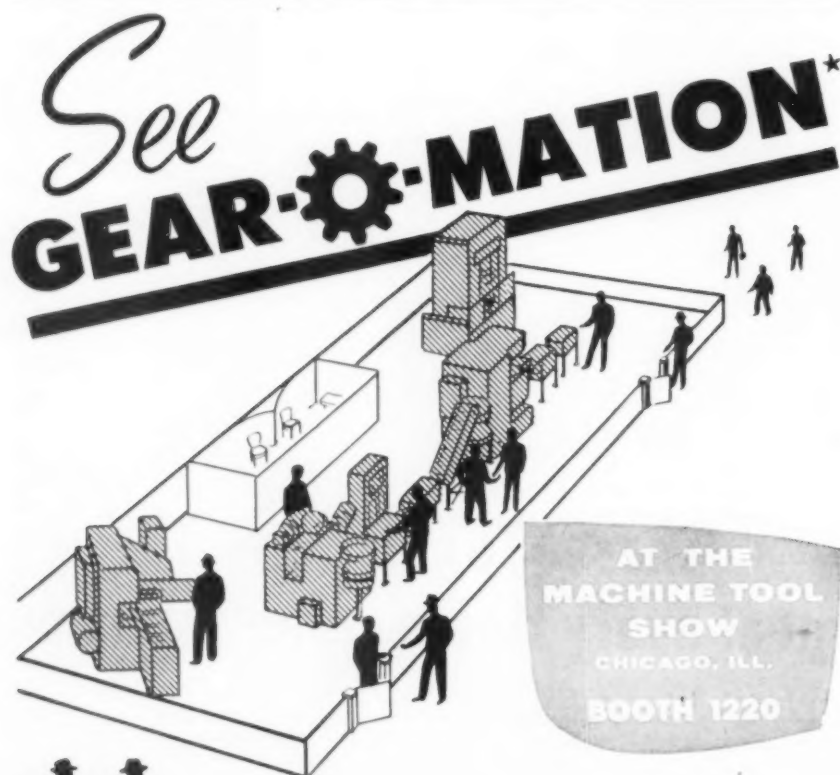
face finish and close dimensional control. Castings produced by the technique have blemish-free surfaces of better than 40 microinch finish which require little or no further conditioning. Control of grain size is possible at metal pouring temperatures as high as 3200 F. The low thermal expansion of the vitreous Glascast powder without abrupt volumetric changes permits dimensional

control to tolerances of ± 0.005 in./in.

Essentially the Glascast easy-to-use powder is 96 percent pure silica glass which is mixed with water to make a casting slip. Poured into a porous plaster form, the slip builds up into a shell which is dried, removed from the plaster and fired. The mold is then ready for use without further treatment. It has excellent resistance to thermal shock, can be fired without danger of cracking, and definition may be held to 0.020 inch. Its low mold expansion enables accurate calculation of metal shrinkage.

The technique may be used with any conventional casting method used in working with metals such as aluminum, brass, carbon and stainless steels, cobalt or chromium base alloys.

The process, which now has been tested successfully in commercial production situations, was under development for three years. Assistance in the program was given by Massachusetts Institute of Technology and Engineered Precision Casting Co. among others.



—or, if you prefer, let us tell you the whole story right now—the story of how you can produce more gears and better gears—more splines and better splines—in less time—at lower cost.

Gear-O-Mation* will be shown in operation at the Machine Tool Show. All units are now in production and have been production-tested.

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CONFLICTING CLAIMS and production records based on different conditions may be cleared up during the Machine Tool Show in Chicago. Armstrong Blum Mfg. Co. has arranged for a firm

Economy Test for Band and Hack Saws

of test engineers to conduct an unbiased test in their booth. A band sawing machine and a hack sawing machine, both using high speed steel blades, will be run continuously on identical work under fixed conditions to determine costs per cut for the two sawing processes.

The machines will both be new Marvel models, shown for the first time, capable of running the blades at the highest speed and heaviest feed that any blade will withstand and still have a practical life on the test logs selected.

TWO NEW INDUSTRIAL 16mm color sound motion pictures have been released by Behr-Manning Corp. First of the two films, "Coated Abrasive Belts Speed Metalworking Production," demonstrates the advantages coated abrasive belts offer the metalworking industry. Emphasized are the adaptability and versatility of modern coated belts, as they are used for mass production metal finishing.

Films Tell Abrasive Story

Second of the films, "Manufacture of Modern Coated Abrasives," serves as a plant tour through Behr-Manning.

Field Notes...

The Sperry Corp. has been consolidated with Remington Rand Inc. to form Sperry Rand Corp. With this consolidation, the new corporation assumed all rights of and all obligations of both firms.

Business formerly conducted by Ford Instrument Co. Div. of Sperry will continue to be operated as before but under the name of Ford Instrument Co. Div. of Sperry Rand Corp.

✓ ✓ ✓

Sharples Chemicals, Inc. was dissolved as a corporation and became an operating division of Pennsylvania Salt Mfg. Co. July 1. Sharples was acquired by Pennsalt Chemicals through an exchange of stock in 1951. Its operations will continue without change under the direction of Lee H. Clark, general manager.

✓ ✓ ✓

Union Twist Drill Co. has taken over the operation and direct management of its entire West Coast operations which formerly were under the direction of the E. B. Sutton Co. None of the three facilities, which were located in Los Angeles, San Francisco and Seattle, have been moved.

purchases

Directors of Pressed Metals of America, Inc. have approved purchase of that company's assets by Frederick W. Richmond, New York industrialist, and a group of investors. The contract, which is subject to stockholders' approval calls for a cash purchase price of more than \$7-million. John W. Leighton, president of Pressed Metals, will continue as board chairman and assume title of vice-president. John D. Leighton, vice-president for nine years and in charge of company management since 1953, will become president and chief executive officer.

✓ ✓ ✓

Negotiations have been completed for the purchase of Super Tool Co. with factories in Detroit and Elk Rapids, Mich., by the Van Norman Co. James Y. Scott, president of Van Norman and Morse Twist Drill and Machine Co., will become chairman of the board of Super Tool, while Gordon Birgbauer

will remain as president. Charles F. Myers, vice-president and director of sales at Morse will assume those same offices at Super Tool. Kenneth R. Fisher will remain as Super Tool sales manager. Hunter G. Trotter assistant to the executive vice-president and general manager at Morse will be coordinator of production between Morse and Super Tool.

✓ ✓ ✓

Barry Controls Inc. has acquired Inasco Co. as the first major step in the company's diversification program. The purchased company will continue operations as the Inasco Co. division with operations distinct and independent from those of the parent company. Dave Ammen, executive assistant to Ervin Pietz, has been named manager of the division.

Private Industry Starts Production on Atomic Plant Components

First privately financed factory designed to build components for atomic power plants is now producing pumps, valves and controls in Cheswick, Pa. Function of these units is to circulate and control radioactive fluids through the hermetically sealed systems of nuclear power plants.

Interesting feature of this Westinghouse Electric Corp. facility is its high-pressure test equipment designed for full-scale testing of the pumps and valves. This equipment, which was built at a cost of about \$400,000, has a more than usual importance because of the exacting requirements which finished

Rights, tooling, equipment and inventory for the Standard Pressed Steel Co.'s line of pressed-steel platform trucks marketed under the trade name of Hallowell, has been purchased by The American Pulley Co. By adding platform trucks to its Materials-Handling Div., the firm rounds out its line to include all types of manually operated materials handling equipment. It is preparing to consolidate all of the new manufacturing operations at the Wissahickon Ave. plant.

✓ ✓ ✓

Assets of the F. Jos. Lamb Co., designers and builders of automation equipment, special machinery and multiple drill heads, have been purchased from the F. Joseph Lamb estate by a Detroit financial group, according to an announcement by Alfred C. Ryan, recently elected president.

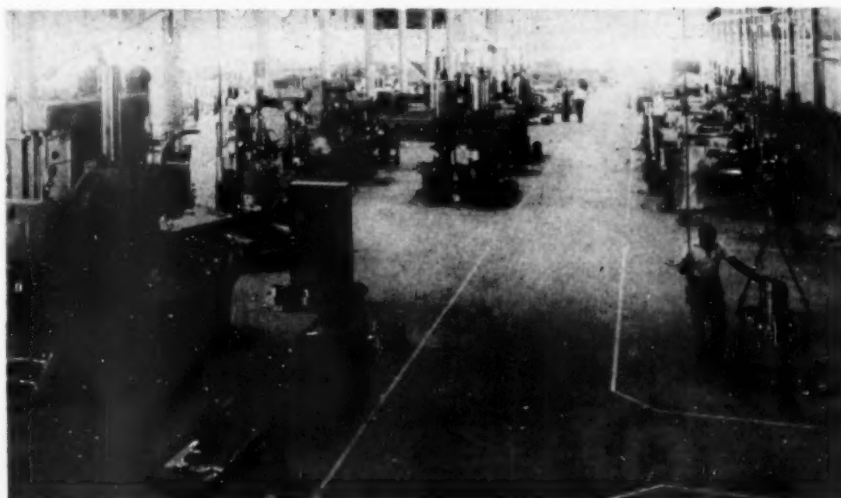
expansions

New program of expansion has been announced for Houghton Laboratories, Inc. research department. A new research center, incorporating the latest

products must meet.

All equipment must be made for zero leakage and by manufacturing methods that will not contaminate the fluids used for heat exchange. With the test department, every pressure and temperature condition under which a pump or valve might operate can be duplicated. Using this with other special methods of leak detection, engineers can be sure that the components are leak-proof.

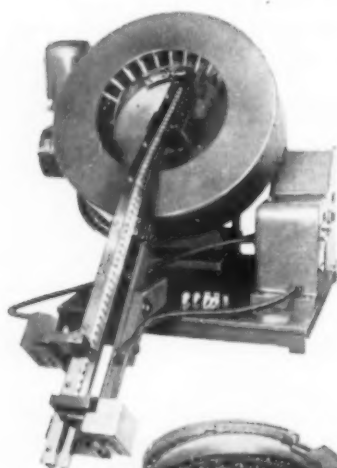
The plant itself has a present manufacturing area of about 87,000 sq ft. Approximately 200 persons, including shop and office personnel, are employed in the operation.



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equipment together with many modern features, will double the floor space and capacity of present quarters, and provide the company with complete facilities for plastic research.

V V V

Openhouse marked the completion of the new Leece-Neville plant at 1374 E. 51st St., Cleveland. The new building, comprising a total of 104,000 sq ft, doubles the overall company facilities.

V V V

Substantial interest in the Prex Corp. has been purchased by Wyman-Gordon Co. With the additional funds thus made available to Prex, plans are being laid for construction of a new plant northwest of Chicago in Franklin Park. Completion of the facilities is scheduled for the latter part of 1956.

name changes

In order to gain an identification more closely descriptive of its products and operations the name of Colonial Broach & Machine Co. has been changed to Colonial Broach Co.

V V V

Barnes Engineering Co. has become the new name of Olympic Development Co. Although originally established as the development division of Olympic Radio & Television Co., it now is an independent engineering company whose activities include development and production of infrared components and instrumentation for remote temperature measurement and control.

V V V

Name of The Tool and Sales Div. of Wesco Machine Corp. has been changed to the Wesco Tool Inc. according to company announcement. At the same time the firm made known its new location at 318 N. Victory Blvd., Burbank, Calif.

new activities

A firm to specialize in design and fabrication of highly automated mechanisms has been organized by Edwin Marcy, Walt Marcy and Thomas B. Bradley under the name of the Bra-Marc Co. The company is located at 4650 Alge St., Los Angeles 39, Calif.

V V V

Facilities for precision gage manufacturing and for a temperature controlled measurement laboratory have been established with the creation of

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INDICATE A-9-269-1

Industrial Gages Inc. at 201 No. Madison St., Rockford, Ill. The new organization is headed by Homer B. Johnson as president, Gordon R. Cedarleaf as general manager, and Harry J. Rowley as superintendent. All three men have extensive experience in this field.

V V V

An office operating in the industrial diamond tool and diamond wheel field has been opened by Daniel S. de Rimini at 550 Fifth Ave., New York 36, N. Y. Mr. de Rimini, who plans to select all diamonds personally, has 28 years' experience in this industry.

V V V

Companies who do not have their own overseas engineering representation may make use of a recently organized company, International Engineers. The new firm, announced by Alan K. Jackson Associates, of Dayton, Ohio, will act as overseas engineering office for electrical, chemical and mechanical manufacturers. Its services will include engineering liaison, translating of technical material and expediting replies from foreign concerns. Operations began with the opening of the first office by William W. Otterson in Europe in July.

moves

Headquarters for the Steel Founders' society of America have been moved from the Midland Bldg. to 606 Terminal Tower Bldg., Cleveland 13, Ohio. The Cleveland staff is headed by F. Kermit Donaldson, executive vice-president.

V V V

Executive and sales offices for Sutton Engineering Co. have been established in the First National Bank Bldg., Pittsburgh. Plant operations are being continued at Bellefonte, Pa.

V V V

All operations of H.E.B. Machine Tools, Inc. have been centralized with the move of its executive and sales offices from New York City to new and larger headquarters at 708 Clare St., Lansing, Mich.

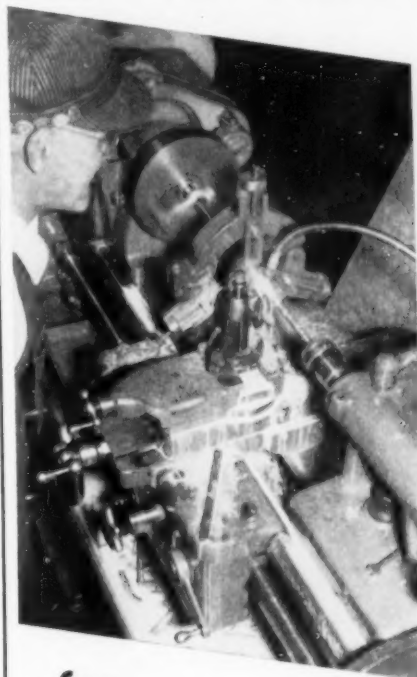
V V V

Onsrud Machine Works Inc. has transferred its metalworking machine division to a new plant at 7720 N. Lehigh Ave., in Niles, Ill. The company's woodworking machinery and turbine tool division will remain at 3900-32 W. Palmer St., Chicago.

V V V

Sales office for Synthane Corp. have been moved from 1013 Genesee Valley Trust Bldg. in Rochester, N. Y., to 137 W. Commercial St., East Rochester.

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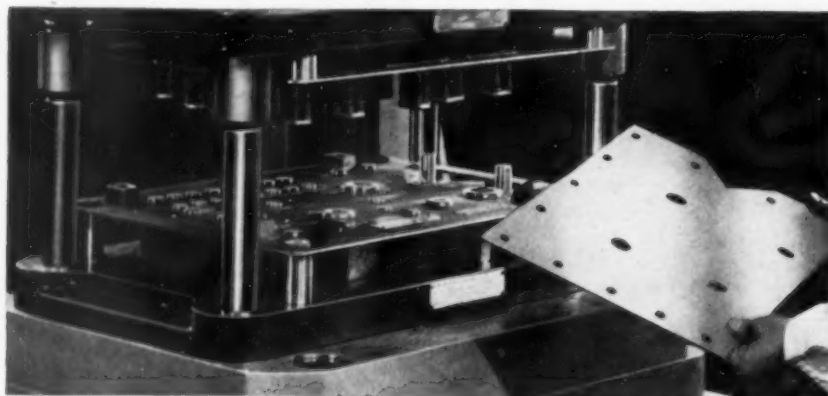


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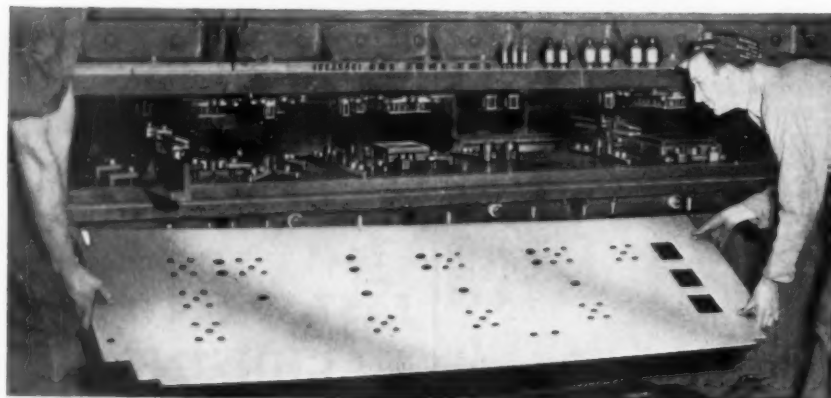
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INDICATE A-9-269-2

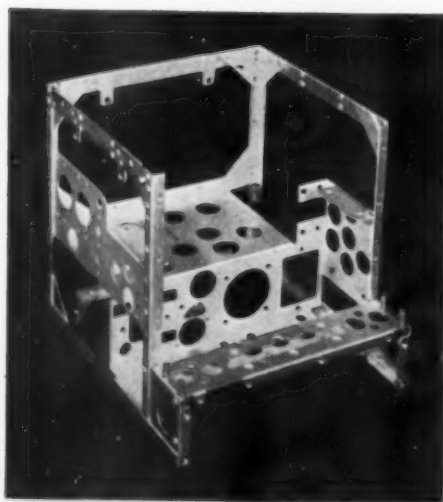
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abstracts of FOREIGN LITERATURE

By M. Kronenberg
Consulting Engineer

Effect of Dull Tools

Dull tools may cause great internal stresses in workpieces, causing cracks and even breakage of the work according to a report by H. Buehler and W. Schepp published in *Zeitschrift des Vereines Deutscher Ingenieure*, Issue 18, 1955. In their tests they used samples of steel of about 2-inch diameter and 6-inch length and similar pieces of brass. They measured deformation by strain gages and used drilling tests to determine stresses. With sharp drills no stresses were found, while stresses up to 20,000 psi were recorded when dull twist drills and large feeds were used. Turning the outside of the work-piece first and drilling afterwards caused an increase in diameters of 0.015 percent, throwing the pieces out of tolerance in many cases.

Lubrication of Gears

The hydrodynamic lubrication theory may be applied to spur gears, using the method developed by G. Niemann, as reported in an article in *Zeitschrift des Vereines Deutscher Ingenieure*, Issue 10, 1955. By this method, it is possible to calculate the magnitude of the oil film and its variations with a high degree of accuracy, to determine the oil pressure, oil losses at the flanks of the teeth and the like for any instant from the beginning to the end of the engagement of the teeth.

Comparative data can be developed and sketches prepared indicating the wear land to be expected. The article contains numerous formulas and diagrams and deals in detail with crater formation, wear due to abrasion and galling, rupture of the teeth as well as conditions where no damage would occur.

Electroplating of Gears

Another article on gears appears in the same issue of the *Zeitschrift des Vereines Deutscher Ingenieure*. The author, J. Heyes, reports on gear electro-

plating investigations performed at the Brunswick Institute of Technology with the assistance of Niemann and Glaubitz.

Their tests showed reductions in force and in oil temperature as well as an improvement of the surface finish with electroplated gears. The oil temperature increased under identical conditions from about 70 to 120 F with ordinary gears but only to about 85 F with electroplated gears. The authors used sets of gears with 34 and 27 teeth, about 8-diam pitch, 20-deg pressure angle and $\frac{3}{8}$ -inch width.

The wear was determined by measuring the loss in weight at various loads expressed in terms of hp-hours. The wear difference is greatest at low loads of 12 hp-hours where the unplated gears lost 4.5 times as much metal as the electroplated gears. At 25 hp-hours the ratio was 3 to 1; likewise at a load of 75 hp-hours. When the load was increased to 130 hp-hours the loss in weight of the unplated gears was 1.25 times that of the electroplated gears.

Accurate measurements showed that the electroplating had no effect on pitch. Electroplating often makes deburring of gears unnecessary and thus contributes to savings in manufacturing cost.

New Concept of Hardness

An interesting article describing a new concept of hardness is authored by E. Kappler in *Zeitschrift des Vereins Deutscher Ingenieure*, Issue 15 of May 15, 1955. This is of significance to tool engineers and metal-cutting research because of its relationship to strain hardening and the Meyer Exponent (*Tool Engineers Handbook* page 316).

The author indicates that traditional methods and definitions for measuring hardness are rather incomplete and unsatisfactory as for example, the Brinell test requires various ball diameters for various load ranges and materials. Thus hardness is not measured as an independent quantity. In a way, a length dimension is measured in inches, which is a quantity independent of the material. Hardness data, on the other hand, depend upon the measuring method and are therefore not consistent but change with the material being tested or the load or other factors.

The author discusses in detail the elastic and plastic deformation taking place in the metal when a ball is pressed into the material. He shows that the elastic, or temporary, deformation must be taken into consideration in addition to the plastic, or permanent, deformation. Metals deformed by strain hardening have different properties than annealed metals. He suggests the introduction of a new hardness number based on strain hardening of the metal at a so-called "infinite load." This

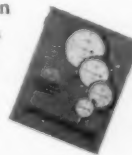


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would permit eliminating the effect of the ball diameter, the load and other test conditions, and result in a true hardness number.

The paper is a definite contribution to this subject and may have far reaching practical results. Subdivisions deal respectively with pure elastic deformation, elastic deformation in the plastic range, plastic behavior of strain hardened metals, under ball pressure, combined effect of plasticity and elasticity of metal and ball, tensile tests, Brinell tests and numerous other items.

Welding

The entire June issue of *Werkstatt und Betrieb* 1955 deals with the development of welding techniques in machine shop applications. F. Bollenrath reports on a method to facilitate the welding process by drilling a hole in one plate when two plates are to be welded together. He indicates that losses, which are frequently caused by rapid wear of the electrodes, poor heat transfer from one piece to the other, chemical reactions of the air, etc., when tungsten electrodes are used in a rare gas atmosphere, are reduced.

W. Brunst, in another article, discusses the various methods used for welding thin sheets by automatic methods. He concludes that resistance welding will remain the most widely used method in the near future.

Multiple spot welding devices and machines are discussed in an article by O. Gengenbach. While welding speeds up to more than 200 spots per minute are about the maximum that can be obtained in single spot welding, multiple spot welding eliminates most of the time lost in feeding the work and reduces the welding time in addition. The author describes several machines developed abroad for use in European production operations.

Use of welding indicators for control of butt welding machines is described by Walter Glage. Four items are registered graphically permitting elimination of poor welds by controlling the electric current, the motion of the carriage, the force exerted by the carriage and the welding time. The method can also be used for spot welding and seam welding processes.

K. L. Zeyen reported on papers on porosity in welded metals published in USA, England, Germany, Norway, France and Switzerland.

Fumes and smoke developed in welding ferrous metals and their effect on the health of the operators and other personnel have been investigated by W. Hummitzsch. He has developed recommendations for the circulation of air, the maximum permissible amount of smoke in the air and other factors essential to operator protection.

Trade Literature

For Free Booklets and Catalogs—
Convenient Request Card on Page 231

Rolling Bearings

Illustrated 52-page bulletin A-638 contains up-to-date technical information on complete line of Dodge SC ball and Dodge-Timken roller bearings; includes tabulated data on dimensions, shaft sizes, weights, radial load ratings and prices, plus engineering drawings, product illustrations, construction detail drawings; also covers application recommendations. Dodge Mfg. Corp., Mishawaka, Ind. **L-9-1**

Tool Steels

Seventy-page brochure presents technical data on more than 50 types of tool steels and cold finished products; includes information on high-speed steels, die steels for hot work and for cold work, carbon and carbon-vanadium tool steels, chrome vanadium tool steels and tool steels for special purposes. Brochure also includes data on heat treatment, composition, hardness-after-tempering charts, and lists representative applications for each type. Vanadium-Alloys Steel Co., Latrobe, Pa. **L-9-2**

Springs

Actual design applications of Negator constant force springs described and illustrated in 16-page technical bulletin 310N showing their features and advantages when used to solve mechanical-loading and power-drive problems; well illustrated. Engineering Dept., Hunter Spring Co., Lansdale, Pa. **L-9-3**

Variable Speed Drives

Descriptions, ratings, dimensions and other engineering data on all models of Cleveland Speed Variator contained in illustrated bulletin No. K-200 stressing its advantages. The Cleveland Worm & Gear Co., 3249059 E. 80th St., Cleveland 4, Ohio. **L-9-4**

Powder Metallurgy

Engineering Manual E-55 is complete and authoritative 52-page treatise on powder metallurgy illustrated with photos, tables, charts and graphs; in addition, case histories serve to present pertinent information for users of metal powder parts. Amplex Div., Chrysler Corp., Detroit 31, Mich. **L-9-5**

Balancing Machines

Company's improved line of type S Dynetric bench and vertical type balancing machines presented in well illustrated bulletin 1165; includes discussions of construction, special features, versatility and other advantages, and outlines specifications for each unit; special section deals with accessories and applications. Gisholt Machine Co., Madison 10, Wis. **L-9-6**

Steel Tubing

Advantages, uses and working data for its SAE hydraulic quality low-carbon steel tubing covered in Bulletin 39; shows comparison of four specifications used for pressure applications; tables give recommended working data, and other technical information. Illustrated. Superior Tube Co., Norristown, Pa. **L-9-7**

Tapping

Universal hand tapping machine for accurate tapping of holes without tap breakage pictured and described in 4-page folder TE4-102; points out specifications, method of operation and special features of unit. The Product Machine Co., 990 Housatonic Ave., Bridgeport 1, Conn. **L-9-8**

Gear Making

Informative 44-page reference brochure commemorating company's 50th anniversary illustrates principal types of gears and miscellaneous combinations, describes most modern methods and techniques of gear testing and explains latest trends in this field; extensively illustrates by engineering graphs, reference tables and photos. Sier-Bath Gear & Pump Co. Inc., 9252 Hudson Blvd., North Bergen, N. J. **L-9-9**

Gages

Company's line of roll thread snap gages for complete external thread inspection presented in well illustrated brochure describing their uses, advantages and special features; includes aid for helping select correct style for job, and dimension and specification tables. Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford 1, Conn. **L-9-10**

Air Line Lubrication

Illustrated brochure, Form 4169, describes line of Air-Line Lubricators made in sizes for use with smallest hand-held air tools to largest quarry-type drills. Selector table helps with choice of proper size lubricator for specific machine or unit. Ingersoll-Rand, 11 Broadway, New York 4, N. Y. **L-9-11**

Master Balls

Eight-page illustrated brochure deals with uses and applications of master balls in toolroom and production gaging; numerous equations, drawings and examples help with explanations of various points. Industrial Tectonics, Inc., Ann Arbor, Mich. **L-9-12**

Control Valves

Easy-reference brochure describes company's line of more than 40,000 hydraulic and pneumatic control valves; includes illustrations, over-all dimensions, descriptions and explanations of operating details for each unit type. Versa Products Co. Inc., Box 32, 249 Scholes St., Brooklyn, N. Y. **L-9-13**

Slitting

Extensively illustrated manual on "Multiple Rotary Slitting Lines" covers basic information on design, selection and operation of slitters and slitting lines and technical details of work involved; also presents illustrated information on company's equipment for such work. Indexed for quick reference. The Yoder Co., 5500 Walworth Ave., Cleveland 2, Ohio. **L-9-14**

Induction Heating

Illustrated 4-page folder explains principles of induction heating and its practical application. Lepel High Frequency Laboratories, Inc., 55th St. and 37th Ave., Woodside 77, New York, N. Y. **L-9-15**

Fork Trucks

Bulletins 5111, 5112, and 5113 describe various capacity models of company's new K-46 electric stand-up hydraulic lift trucks; cover specifications, engineering features and advantages. Yale Materials Handling Div., The Yale & Towne Mfg. Co., 11000 Roosevelt Blvd., Philadelphia 15, Pa. **L-9-16**

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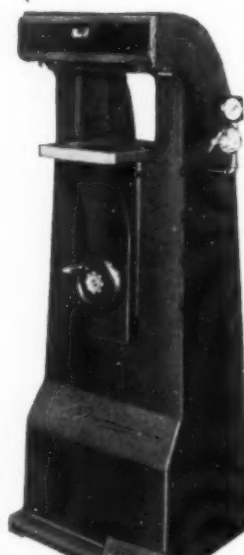


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ACCURACY...
UNIFORMITY...
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HYDRAULIC
#650
MARKING MACHINE

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HYDRA-PNEUMATIC
#700
MARKING MACHINE



Fully automatic, the #650
and #700 Marking Machines
are used for production marking
round or flat surfaces.

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Standard or custom tooling for any marking ap-
plication can be shipped from stock or designed
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STAMP WORKS, INC.

MARKING DIE & MACHINERY DIV.

FRANKLIN AVENUE • HARTFORD, CONNECTICUT

by Parker

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-274

Indexing Devices

Twenty-page catalog covers company's 8 and 12-inch Super-Spacers and their accessories; gives complete operating instructions, specifications of both units and accessories, and pictures units in various machining operations; explains features of units that provide fast, accurate and economical results. Hartford Special Machinery Co., Hartford, Conn. **L-9-17**

Precision Measurement

Revised 258-page edition of catalog and handbook, No. 36, provides technical and engineering information on problems and methods pertinent to precision measurements; contains material on such topics as Vogel exact equations for wire measurement of screw threads including profile; Vogel master approximate formula for screw thread measurement; consolidated gear tables with K and M values for two or more wire diameters; information on wire measurement of enlarged pinions; reduced gears and helical gears; unified thread form and series; tables of measurement and other useful information arranged for easy reference. Request only on company letterhead directly from The Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

Solenoid Valves

Extensively illustrated catalog No. D1 offers complete information on company's line of universal, all-purpose 4-way, miniature cutoff, high-pressure hydraulic, high-flow industrial and special valves in addition to presenting pertinent information such as engineering reference tables, current and flow data and a list of definition of terms. Skinner Electric Valve Div. of the Skinner Chuck Co., New Britain, Conn. **L-9-18**

Corrosion Control

Thirty-two page illustrated booklet, "How Zinc Controls Corrosion," describes ways zinc lengthens life of steel products and reduces maintenance costs. Drawings, charts and photos help illustrate corrosion control characteristics of zinc coatings, pigments and anodes. Request directly from American Zinc Institute, Inc., 60 E. 42nd St., New York 17, N. Y.

Resistance Welding

Bulletin 334-3 describes company's Type PMCO 2 ST air operated, press type 3-phase Mudo-wave spot welder; discusses details of its operation, points out special features and advantages; illustrated with charts, photos and schematic drawings. Dept. L-2 Sciaky Bros., Inc., 4915 W. 67th St., Chicago, Ill. **L-9-19**

Powder Metal Sintering

Bulletin B-101 illustrates and describes company's line of "Furnaces for Sintering Powder Metal Products." The Draver Co., Red Lion Rd. and Philmont Ave., Bethayres, Pa. L-9-20

Presses

More than 70 different types of automatic dieing machines for high-speed metal stamping and assembly operations, precision power presses, packaging equipment and machinery for glass manufacture, presented in illustrated 40-page brochure; includes descriptions and specifications for each of 275 units from company's four divisions: Henry & Wright, The V & O Press Co., Standard-Knapp and Hartford-Empire Co. Emhart Mfg. Co., 333 Homestead Ave., Hartford 2, Conn. L-9-21

Blast Cleaning

First issue of newly established quarterly brochure dealing with precision cleaning and finishing contains complete discussion of wet blasting process and diversity of suitable applications; and also includes case history items about its uses. To be added to the mailing list for this publication, write directly to American Wheelabrator & Equipment Corp., 1182 South Byrkit St., Mishawaka, Ind.

Mounted Wheels

Sample folder contains two mounted wheels $\frac{3}{8}$ by $\frac{3}{8}$ inch straight wheels on $\frac{1}{8}$ inch mandrel for actual job testing, so user can demonstrate for himself quality and advantages of these wheels. For this free sample write directly to Chicago Wheel and Mfg. Co., Dept. TE, 1101 W. Monroe St., Chicago, Ill.

Needle Bearings

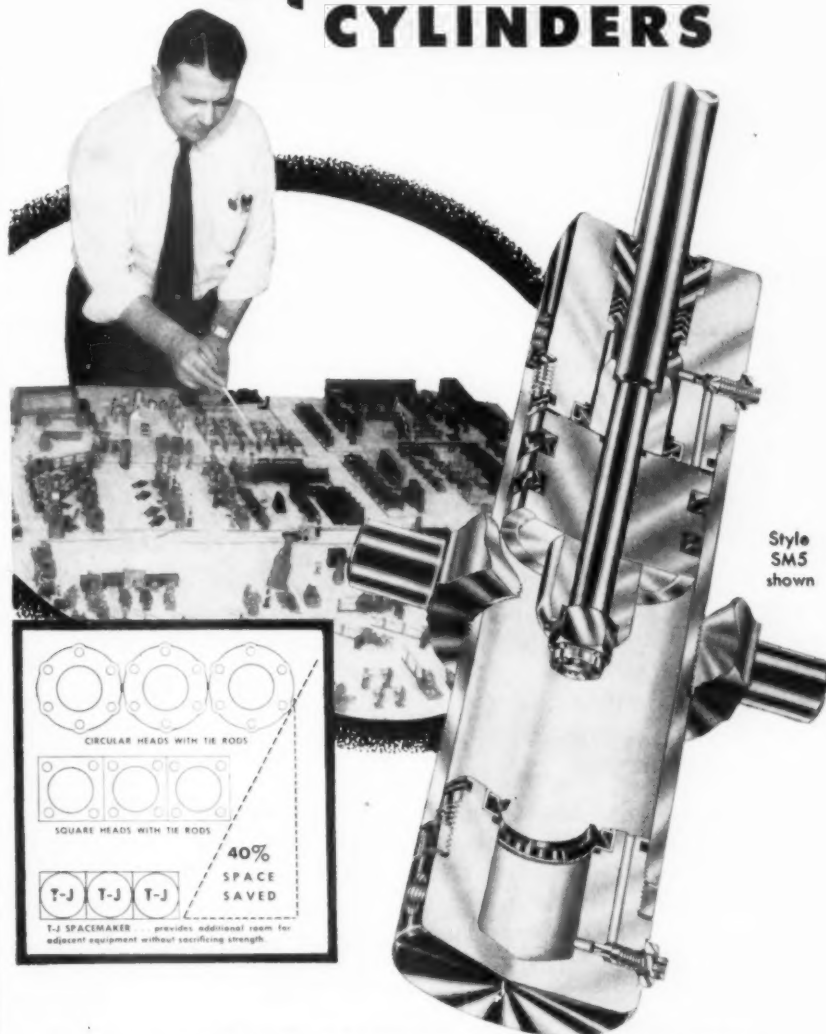
Comprehensive engineering manual No. 55 presents useful technical information on design, application and use data for five types of needle bearings; organized for practical use to aid in selecting proper needle bearing for particular use by type, size and suitability; well illustrated by drawings and graphs; tab indexed for quick reference. The Torrington Co., Torrington, Conn. L-9-22

Plug and Ring Gages

Comprehensive catalog No. 2 describes and illustrates company's balanced action threaded and cylindrical plug and ring gages; gives dimensions, specifications and prices; also includes engineering information on use of gages, standards and tolerances. Winter Brothers Co., Rochester, Mich. L-9-23

Automate for top performance with...

T-J Spacemaker CYLINDERS



Style SM5 shown

- The Only Cylinders with all the Extras as Standard
- OIL pressure to 750—AIR to 200 P.S.I.
- New Compact Design . . . Saves up to 40% Space
- Proven Performance . . . with Extra High Safety Factor
- Super Cushion Flexible Seals for Air . . . New Self-Aligning Master Oil Cushion
- Hard Chrome Plated Bodies and Piston Rods (Standard)
- Only from T-J can you get these new ingenious cushion designs

OFF SHELF
DELIVERY

More and more of industry's automation problems today—solved with T-J Spacemaker Cylinders! New compact design and many more plus features for a new high in efficient cylinder performance and dependability. Wide range of styles, capacities . . . to help you *save labor, reduce costs* on all kinds of push-pull-lift jobs. Send for bulletin SM-155-1. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON
PNEUMATIC, AIR AND HYDRAULIC CYLINDERS, CUTTERS, CLAMPERS

Member of the National
Fluid Power Association

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-275

How to Know

BEFORE DELIVERY

What Results You'll Get from the TOOL AND DIE STEELS You Order



Maximum performance from your tools and dies is possible *only* when your design, toolmaking and heat treating are backed by sound, top quality tool and die steels. You control the first *three factors*. But how can you be sure, *before delivery*, that the die steels you order will deliver the *results* you want?

To give you this assurance, Carpenter puts its "mark" on *every* grade of die steel it produces. This mark, or brand name, is the sign of *consistent Carpenter quality*.

In back of it, at Carpenter, is a long list of painstaking controls. These include Hot Acid Etch Inspection, Ultrasonic Testing, Tough Timbre and Hardenability Testing. And that's only the start of many *extras* you get with Carpenter brands of tool and die steels . . . extras that enable you to predict *in advance* results you'll get on the job!

Accurate selection is one example. With the Carpenter-pioneered Matched Set Method your men take the guesswork from choosing the one steel best suited to the job. *Trouble-free heat treating* is another. Through tests and controls, Carpenter has simplified the heat treatment of Matched Tool and Die Steels beyond anything previously known. Further, a wealth of printed information gives you a "blueprint" to minimize costly heat treating hazards.

All this . . . and more, stands behind every bar of Carpenter Matched Tool and Die Steel. So, when you see any of these Carpenter brand names, you can feel *safe* in the knowledge you're getting *full value* from your investment. Specify Carpenter Matched Tool and Die Steels. It costs you no more to be *sure*!

NO. 610 (Air-Wear)

NO. 484 (Air-Hard)

VEGA (Air-Tough)

HAMPDEN (Oil-Wear)

STENTOR (Oil-Hard)

R. D. S. (Oil-Tough)

K-W (Water-Wear)

NO. 11 SPECIAL (Water-Hard)

SOLAR (Water-Tough)

STAR-ZENITH (Red-Wear)

T-K (Red-Hard)

NO. 883 (Red-Tough)

And each bar is colored *full length* with a distinctive color for each grade. Here's *positive* identification!

Carpenter

Matched Tool and Die Steels



Export Department: The Carpenter Steel Co., Port Washington, N.Y.—"CARSTEELCO"
THE CARPENTER STEEL CO., 154 W. Bern St., Reading, Pa.

Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U.S.A. and Canada

when you visit

**THE
MACHINE TOOL
SHOW**

CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE



don't miss the

ALL-STAR PERFORMANCE

SEE THE

Potter & Johnston Automatic Turret Lathes IN ACTION!



THE 4-U AUTOMATIC... extra power to take full advantage of
faster-cutting carbide tooling.

...and the **6DRE-40** ... real productive
power (40 hp) for lower unit cost on really
tough jobs.

THE 3-U AUTOMATIC

... the right machine to produce
small, precision parts faster, better.

SEE FOR YOURSELF...



how these designed-for-
tomorrow machines can help
you build greater productive
efficiency today!

POTTER & JOHNSTON Co.
PAWTUCKET, RHODE ISLAND

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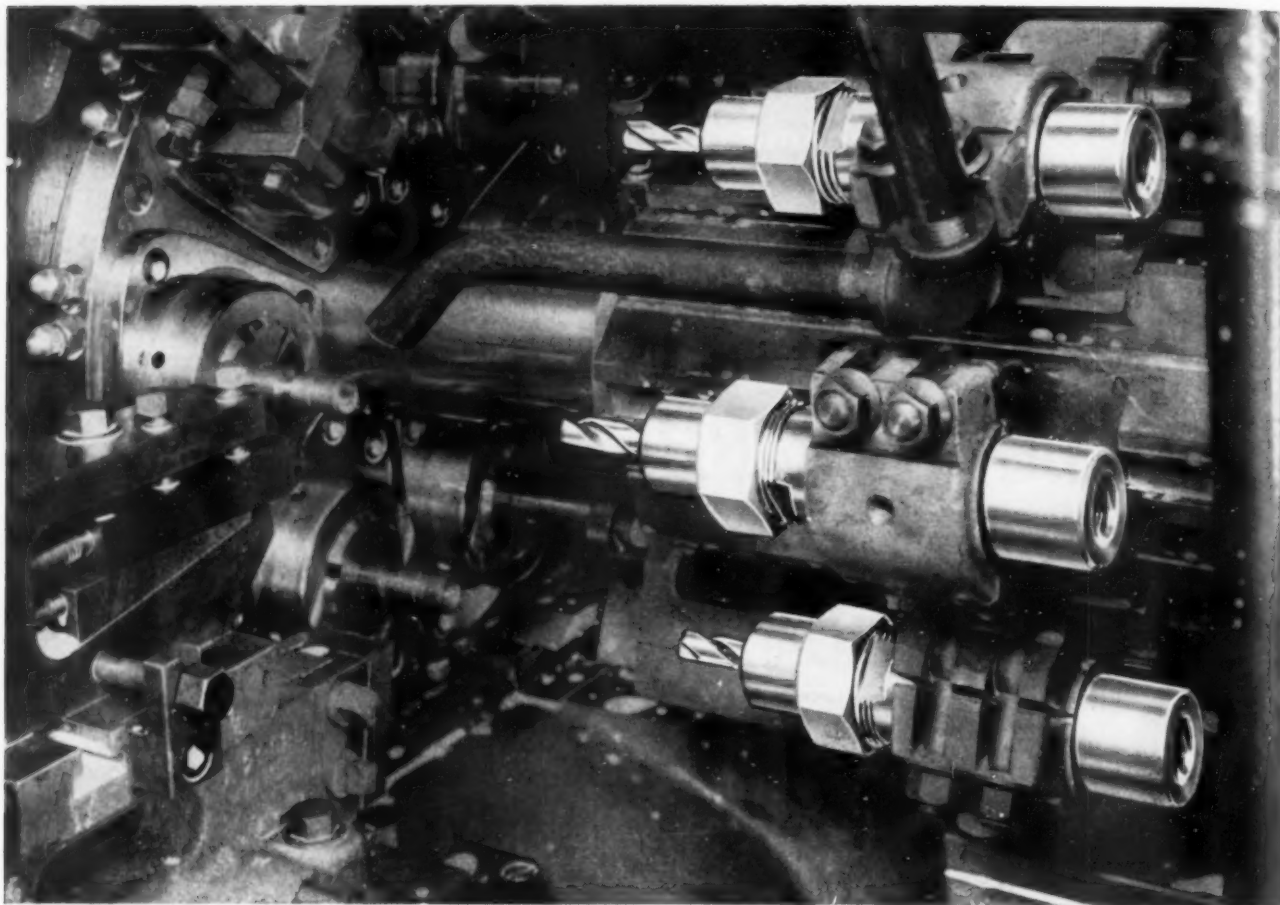
PRATT & WHITNEY

DIVISION NILES - BEMENT - POND COMPANY

PRECISION PRODUCTION TOOLING

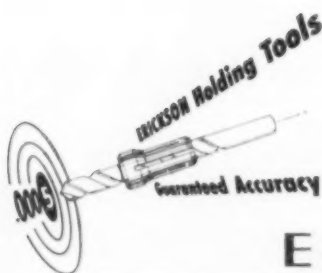


FOR MORE THAN FIFTY YEARS



Courtesy The National Acme Co.

*better holding tools
give a tighter grip
on production costs*



Wide experience with Erickson chucks explodes the *idea* that ordinary holding tools "will do" . . . emphasizes the *fact* that your production costs plummet with Erickson's superior holding power and accuracy.

That's why The National Acme Co. usually furnishes Erickson collet chucks. Because with Erickson you reduce set-up time . . . get faster feeds and speeds by "stubbing" tools. Guaranteed accuracy of .0005" and greater gripping power assure proper drill alignment . . . drills cut evenly on both lips . . . give more holes per grind.

So come to grips with your Number One Problem—high production costs. The first step is to get the Erickson story.

Send for Catalog K today; you'll find many interesting applications for all Erickson holding tools.

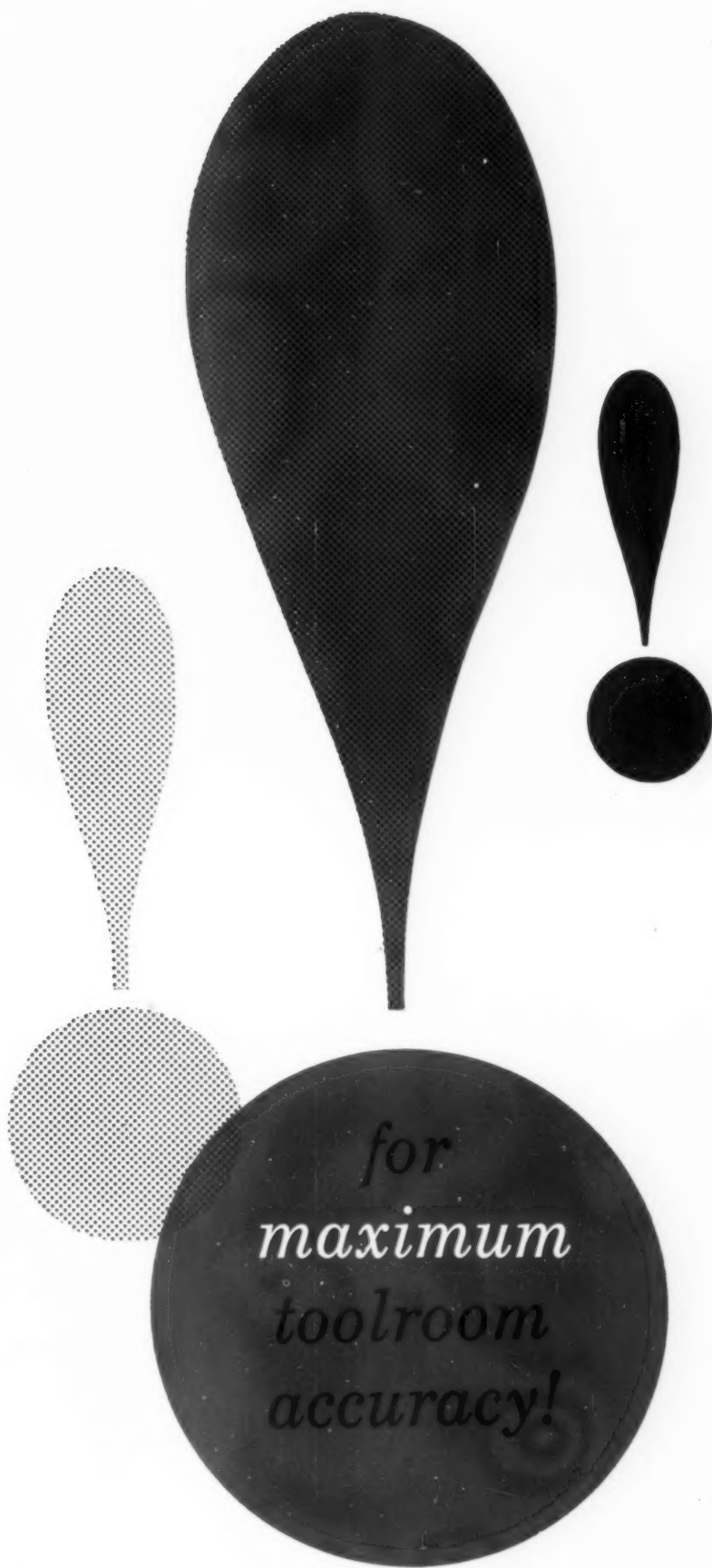


ERICKSON TOOL COMPANY

2303-9 Hamilton Avenue • Cleveland 14, Ohio

COLLET CHUCKS • FLOATING HOLDERS • TAP CHUCKS • TAP HOLDERS • AIR-OPERATED CHUCKS
EXPANDING MANDRELS • SPECIAL HOLDING FIXTURES

AA-1358



*for
maximum
toolroom
accuracy!*

see *Hendey*
for improved accuracy and speed...

The Hendey 9" Tool and Gage — Maker's Lathe provides maximum precision and versatility for toolroom and production use. Some of its features include 24" center distance and 10-1/4" swing, sixty-six thread and feed changes, and an independent lead screw.

This Hendey lathe has a new magnetic amplifier drive unit for speeds which are infinitely variable and which can be changed smoothly and easily while under load. This type of drive is very simple and requires a minimum of maintenance. Spindle speeds range from 15 RPM to 3000 RPM. Speeds from 15 RPM to 250 RPM are available through back gears. Start — stop, forward — reverse, and spindle speed selection are easily controlled. This machine can also be furnished with an electronic drive unit.

9" tool and gage-maker's lathe



highly adaptable and sensitive



See them in action in Booth No. 221

greater flexibility in tool room work

12" crank shaper



The Henley 12" Crank Shaper is a high-speed universal machine designed for maximum flexibility in a wide variety of cuts. It is constructed especially for precision work, and speeds up to 200 strokes per minute are available. The vise and table are the finest available on any shaper, allowing the work to be positioned to any desired angle. The universal table will rotate 360° about its axis. The tilting top can be set to 15° on either side of the horizontal position. This machine is also available in 16" and 20" sizes.

In addition to the vise and table, standard equipment includes dual mechanical controls, automatic lubrication, power down feed, quick-change swivel head, pre-loaded Timken bearings on the crank gear, and helical teeth on the crank gear and back gear.

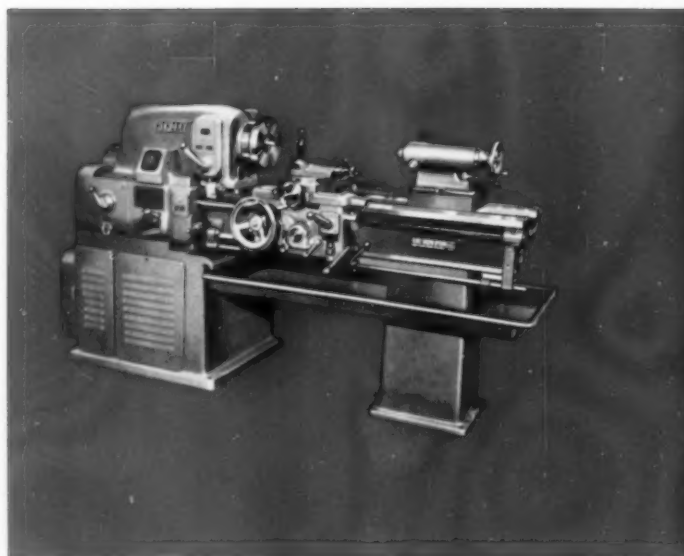
for precision work at high speed

Henley machine division
BARBER-COLMAN COMPANY
115 LOOMIS ST., ROCKFORD, ILLINOIS



see these new *Hendey* production lathes!

These new modern lathes are indicative of the progress which Barber-Colman has already attained with the Hendey line and which they will continue to maintain in the future. Many outstanding new features will help you to increase accuracy and efficiency and to reduce production costs. See these new machines in action to determine how they can fill your production requirements.



NO. 2E PRECISION LATHE is equipped with Hendey exclusive "Selectronic" speed control which provides a quieter, more efficient drive with closer control over cutting speeds, especially in the lower speed range. Speeds are instantly available and may be selected either pre-set or while under cut through the full range up to 1500 RPM. Back gear drive is available from 15 RPM to 187 RPM. Further operating efficiency is provided through single-lever control of start, stop and reverse. Dynamic breaking allows smooth and rapid stopping of the spindle.



32-SPEED GEARED HEAD LATHE is designed specifically for high-speed precision production. The standard machine is equipped with a 15 HP motor, and spindle speeds up to 1500 RPM are available. It is designed to accommodate a 20 HP motor for speeds to 2000 RPM. This machine can be furnished in 13", 16" and 20" sizes. Other features include 66 thread and feed changes, automatic lubrication, independent lead screw, high-speed reversing mechanism, induction hardened and precision ground bed ways, precision automatic stops, and heavy-duty, two-speed tail stock.

Hendey machine division
BARBER-COLMAN COMPANY
113 LOOMIS ST., ROCKFORD, ILLINOIS



Why Pipe Machinery Gages Can Never Be Cheap

●The Finishing Room and Measuring Laboratory, the very heart of our gage plant, are both maintained at a constant standard 68 degree temperature.

Here, highly skilled, unhurried men and women, with a high average experience in this work, are the guardians of our quality. They work under ideal conditions and with the very latest of finishing and inspection equipment.

Shown on this page are some of the measuring and finishing instruments in constant use by these people.

Only because of this investment in experience and the very finest equipment can we assure you of the top accuracy that has made The Pipe Machinery Company a leader in the quality gage field.

A REQUEST ON YOUR LETTERHEAD TODAY
WILL BRING YOU OUR CATALOG NO. 10

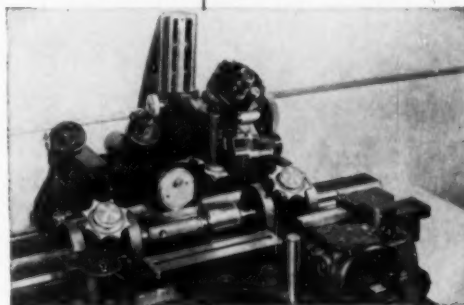
THE PIPE MACHINERY COMPANY

SINCE 1912

29101 LAKELAND BLVD. • WICKLIFFE, OHIO



Length Measuring Machine in our Measuring Laboratory used on lengths, diameters of thread gages, and for tapers for practical measurements to .00001"



This Universal Measuring Microscope magnifies 30 times and measures to half .0001"; permits easy estimation to .00001" on lead, angle, and thread depth.

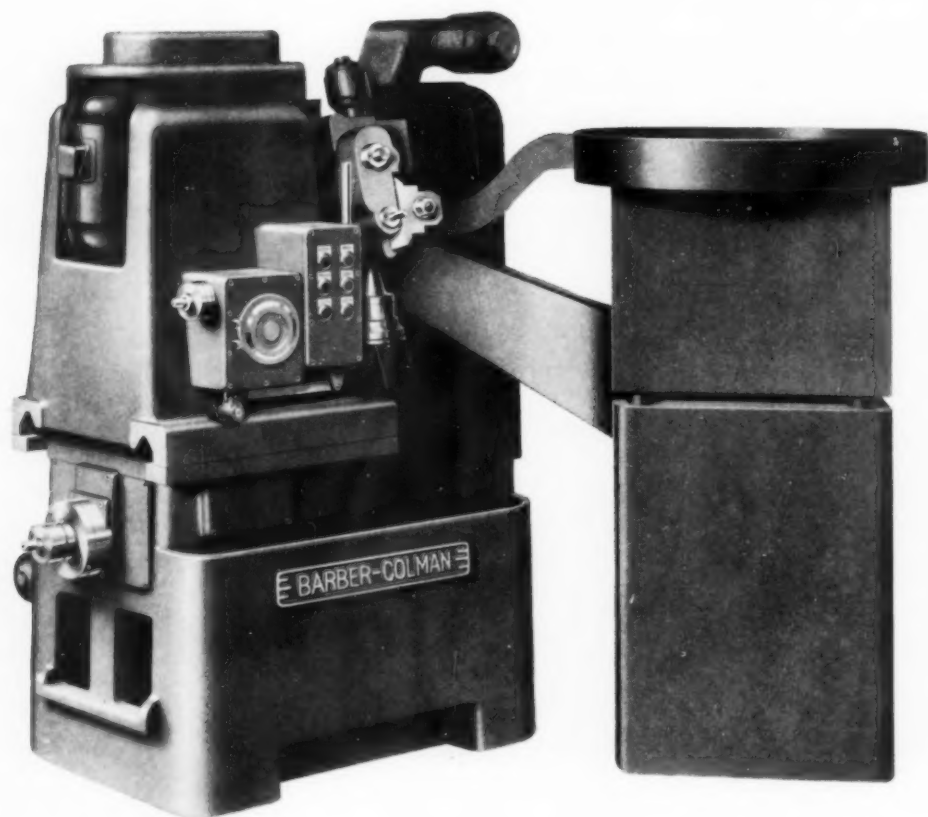


Partial view of the Measuring Laboratory with some of our precision measuring apparatus used for final inspection of PM Co. Gages

Some of the precision instruments used by skilled personnel who lap threads and finish gages may be seen in this partial view of our Finishing Department.



a NEW automatic high-speed hobbing machine...



The Barber-Colman No. 3-6 Vertical Hobbing Machine is a single-purpose machine designed and built to meet the requirements of a specific job. The machine has standard basic elements, but the tooling, loading, gaging and handling are designed for maximum production of a specific part. Its high-speed operation makes it adaptable to all mass produced parts up to 3" diameter by 6" face width. Maximum pitch capacity is 10 DP. Hob speeds for carbide hobbing of non-ferrous and non-metallic blanks are available. Features which contribute to the high-speed operation of this machine include exceptionally large heat-treated and ground bed ways, short drives to the work and hob spindles, and a hardened and ground multiple-thread index worm.



In operation at the machine tool show . . . Booth No. 1322, Amphitheater

The No. 3-6 will be in production operation at our booth. Drop in and see it work. Get full information and literature there, with estimates for your jobs.

B U I L D E R S O F P R E C I S I O N G E A R

BARBER • COLMAN

No. 3-6

for high production

gear cutting

with automatic handling,

loading and gaging

automatic loading

Blanks are automatically loaded from a vibratory hopper loading device. However, the type and variety of loading and handling devices with which this machine can be equipped are almost unlimited. Loading can be by magazine or conveyor when required.

automatic gaging

The gaging mechanism segregates gears of the correct size from those that are oversize or undersize. Size inspection is made by measuring over balls. If a pre-determined percentage of gears are out of tolerance, the machine can be made to stop automatically. The gaging unit can be furnished to inspect almost any elements of the gear.

automatic hob shifter

The automatic hob shifter can be set to shift a certain amount after each cycle, or it can be arranged to shift after a certain number of parts have been cut. Shifting increments can be changed easily by means of a graduated dial. The hob slide is clamped pneumatically.

centerdistance adjustment

The hob is set to the proper depth by means of a centerdistance adjusting mechanism, eliminating the usual time-consuming method of setting the hob to depth. The hob is placed in a fixture, and an indicator finger is set against the outside diameter. The indicator is calibrated to show the centerdistance between the work and the hob. This centerdistance setting is made by means of a graduated dial on the machine.

Some basic machine facts:

- Short, Compact Drives to Work and Hob Spindles
- Anti-Friction Work and Hob Spindle Bearings—Tapered Roller Type
- Pneumatic Work Clamping
- Self-Contained Lubrication and Coolant Supply
- Heat-Treated and Ground Bed V-Ways
- 2 HP, 1800 RPM Drive Motor
- Unitized Construction

HOBS • CUTTERS • REAMERS
HOBBIING MACHINES
HOB SHARPENING MACHINES



Barber-Colman Company

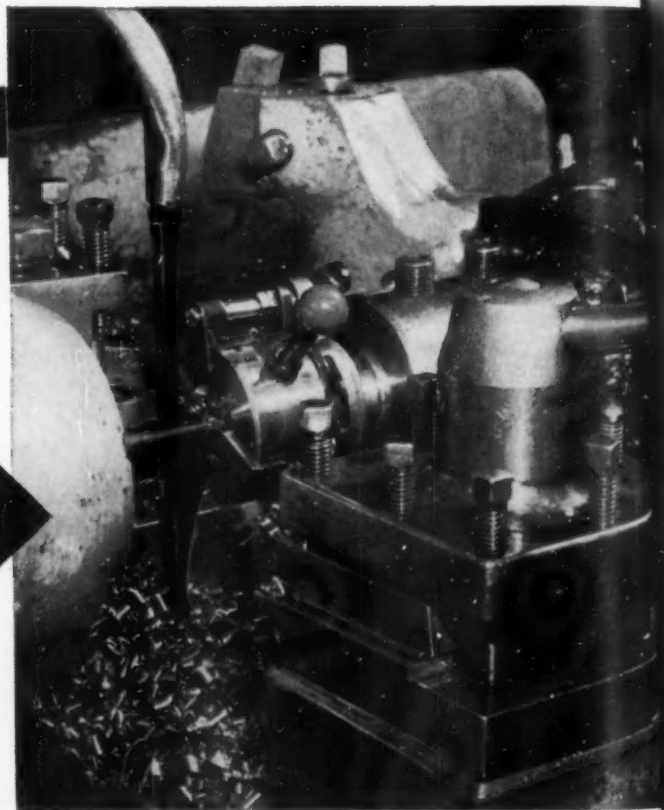
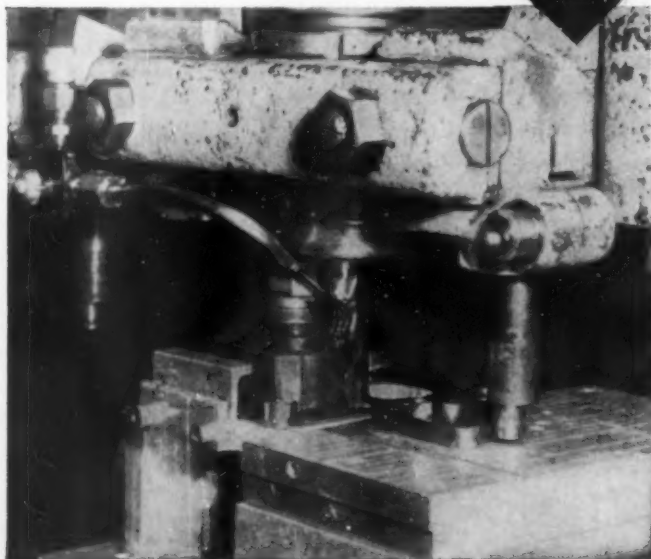
GENERAL OFFICES AND PLANT, 639 ROCK STREET, ROCKFORD, ILL.

H O B S A N D M A C H I N E S S I N C E 1 9 1 1

*"We found the key to
successful machining of ti-stainless--
GULF ELECTRO CUTTING OIL"*

says Mr. D. E. Gillmor, Vice President of Gillmors, Inc., Long Island, N.Y.

Improved machining practice on ti-stainless quickly followed a switch to Gulf Electro Cutting Oil in this shop, with results like these: from 20 pieces per tool grind to as many as 45; and finish improved about 43 microns—from 63, the best obtainable with other cutting oils, to as low as 15. For additional information, see page 144 of the September 13, 1954 issue of American Machinist.



Gulf Oil Corporation • Gulf Refining Company

1822 GULF BUILDING, PITTSBURGH 30, PA.

"We increased our tool life 40% and improved the finish 43 microns"



Mr. D. E. Gillmor, Vice President of Gillmors, Inc., Gulf Assistant District Manager Don Gallaher, and Mr. George Glaeser, General Foreman of Gillmors, examine several of the ti-stainless parts machined with Gulf Electro Cutting Oil.

*"W*E tried scores of cutting oils over a period of months in an effort to increase tool life and get a better finish in machining type 321 titanium stainless steel. Then a Gulf Sales Engineer recommended Gulf Electro Cutting Oil.

"Right away results were phenomenal. Tool life was increased over 40% and surface finish was improved 43 microns."

Gulf Electro Cutting Oil has proved to be the answer to many tough machining problems like this. It contains both free sulphur—held in stable solution—and sulphurized mineral oil, in which the sulphur is chemically combined by an exclu-

sive Gulf process. This combination provides high sulphur activity over the entire range of a cutting operation—gives the tool maximum protection and helps to reduce built-up edge. It also has excellent anti-weld characteristics and extreme load carrying ability.

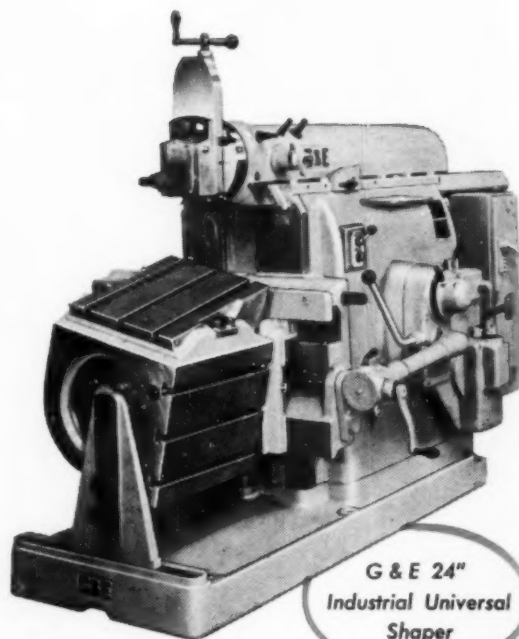
And remember that Gulf provides a complete line of quality cutting oils that will help you get improved production and longer tool life in all your machining operations. Write, wire, or phone your nearest Gulf office and have a Gulf Sales Engineer recommend the most suitable type for every job.



THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

SEE
the NEWEST
DEVELOPMENTS in
SHAPERS
and
GEAR
HOBBERS

Exhibited by



G & E 24"
 Industrial Universal
 Shaper

GOULD & EBERHARDT

INCORPORATED

IRVINGTON 11,

N. J., U. S. A.

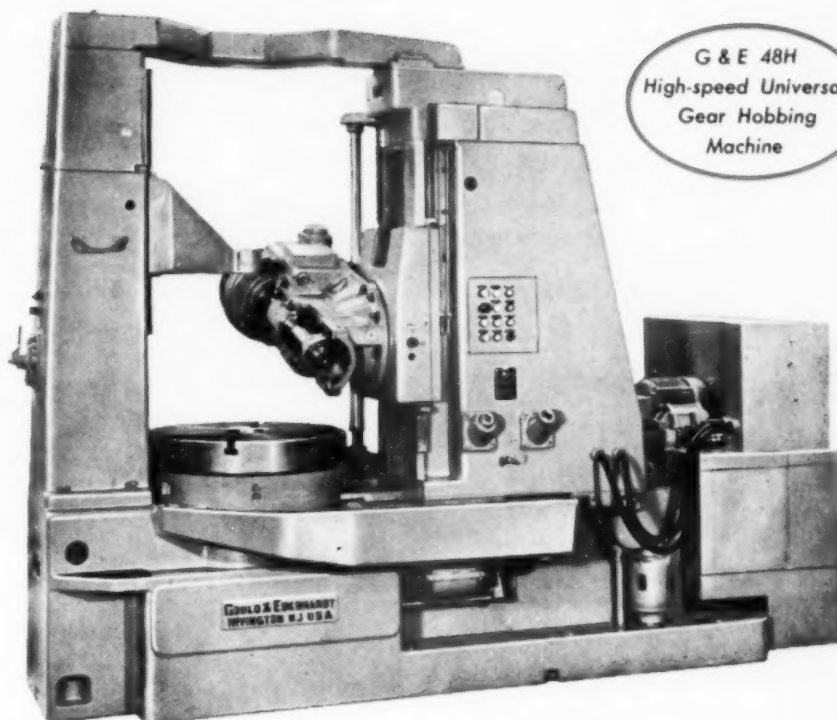


G & E 10HQ Hoblique
 Helical Gear Hobbing
 Machine

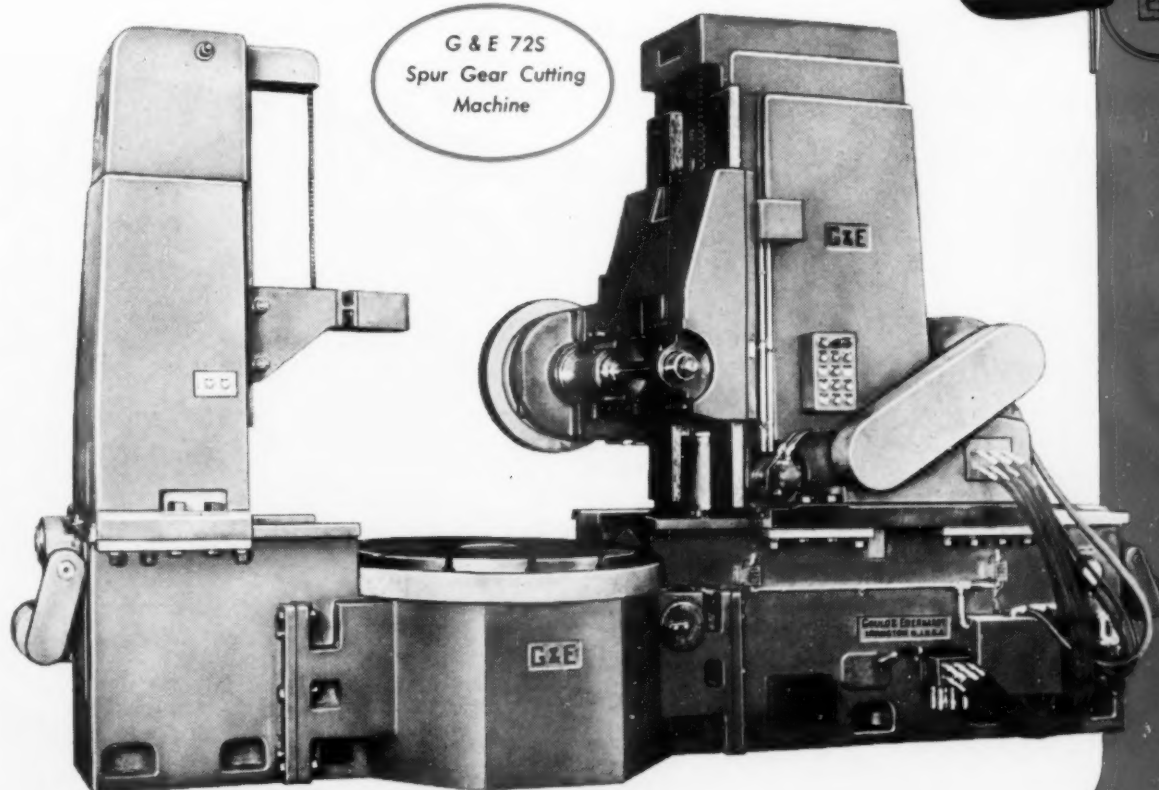
in **BOOTH 1424**

An Invitation

We cordially invite you to visit our display of the latest developments in shapers and gear hobbing machines at the Show. If you are unable to attend, write us for new catalogs describing the machines in which you are interested. We welcome the opportunity to serve you.



G & E 48H
High-speed Universal
Gear Hobbing
Machine

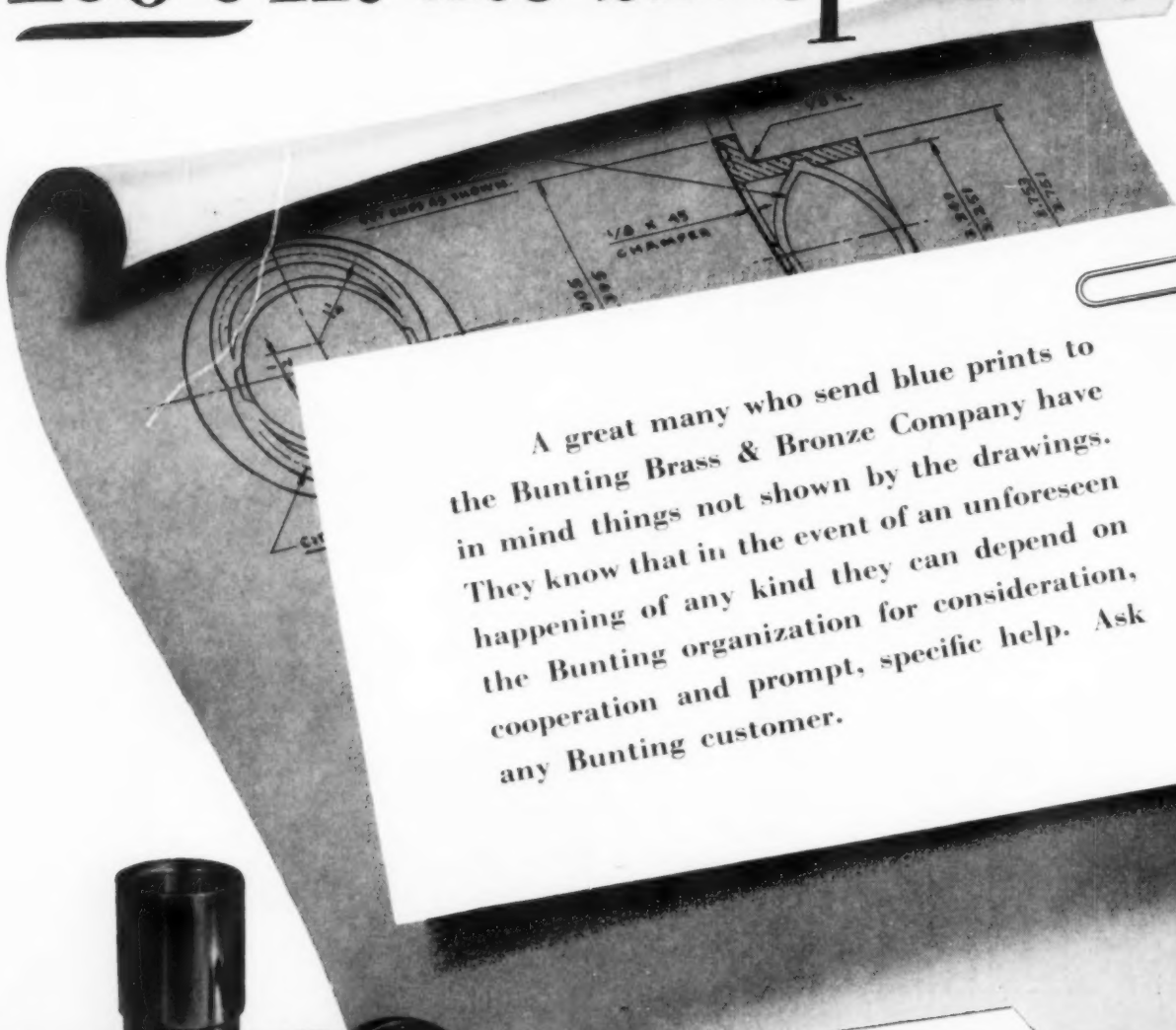


G & E 72S
Spur Gear Cutting
Machine

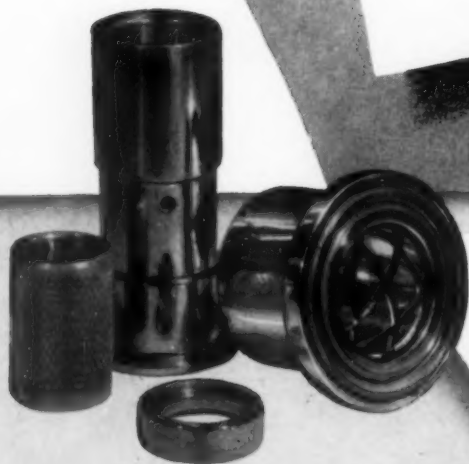
THE
MACHINE TOOL
SHOW
CHICAGO, ILL.
SEPT. 8-17, 1955
INTERNATIONAL AMPHITHEATRE



not in the blueprint..



A great many who send blue prints to the Bunting Brass & Bronze Company have in mind things not shown by the drawings. They know that in the event of an unforeseen happening of any kind they can depend on the Bunting organization for consideration, cooperation and prompt, specific help. Ask any Bunting customer.



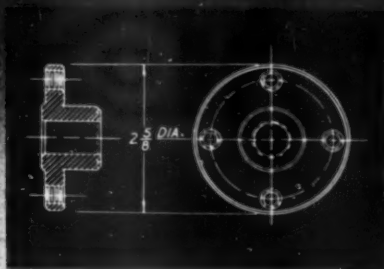
The sleeve bearing is not complex in structure; it conforms readily to design requirements; it is easily installed. Cast Bearing Bronze is the most adaptable of all sleeve bearing materials; it possesses excellent anti-friction properties. With proper film lubrication, its coefficient of friction is as low as can be obtained with any other bearing type. A successful Bunting Bronze bearing installation is readily attainable. We ask the opportunity to work with you, and to quote on your requirements.

Bunting

BRONZE BEARINGS • PRECISION BRONZE BARS • BUSHINGS

THE BUNTING BRASS & BRONZE COMPANY • TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES

GRILLS,
COUNTERSINKS,
LEAD-SCREW-TAPS,
AND REAMS



Use of FEEDEX unit makes possible the vertical design, saving floor space.



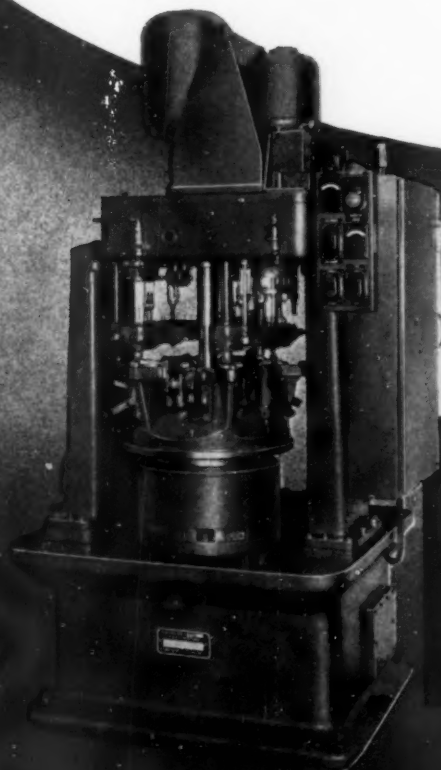
**For fast production
of small parts —
machines built
around FEEDEX units**

FEEDEX is a compact continuous-cycle feeding and indexing mechanism, with emphasis on the unusually smooth feed. Its speed equals the fastest of machines

in its class. Its wide scope of operations includes drilling, light milling, boring, reaming, chamfering, and tapping.

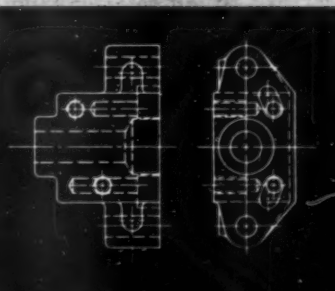
KRUEGER-BARNES CORPORATION

1469 E. Grand Blvd., Detroit 11, Michigan
Designers and Builders of High Production Machine Tools



A SIMILAR MACHINE FOR ANOTHER PART

The FEEDEX cam feed gives a very smooth penetration.



**SEE FEEDEX
IN OPERATION
AT BOOTH 1223**

*Machine Tool And
Production Engineering*

MORRIS AIR-OIL-MATIC DRILL UNITS



Fast, low-cost production for drilling and allied operations.

- Adjustable Feed
- Wide range of spindle speeds
- Convenient controls
- Hydraulically controlled

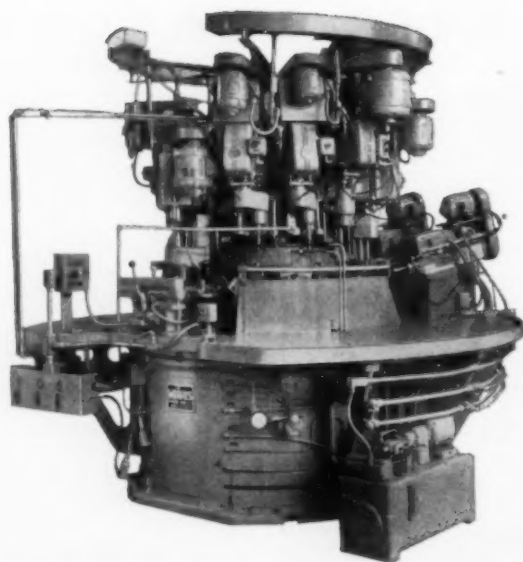
Available for use on Special Purpose Machines like the MORRIS High Production Machines illustrated.

MORRIS CAM-MATIC DRILL UNITS



Newly introduced, MORRIS CAM-MATIC Drill Units provide automatic, electrically controlled, mechanically driven drilling, tapping and allied operations . . . with built-in accuracy, dependability and convenience. Specially-featured electric clutch provides automatic thrust control and dull or broken drill detection.

Morris MOR-SPEED



MORRIS HIGH PRODUCTION MACHINES

Special Operations with STANDARD Units

- Specialized Production
- Automatic Indexing and Positioning
- Multiple Operations
- Easy Model Changeover

You can have swift, accurate production on multiple operations like drilling, reaming and tapping with MORRIS Mor-Speed High Production Machines. They provide special operations using standard units, with completely automatic operation. Easy re-alignment speeds model changeovers.

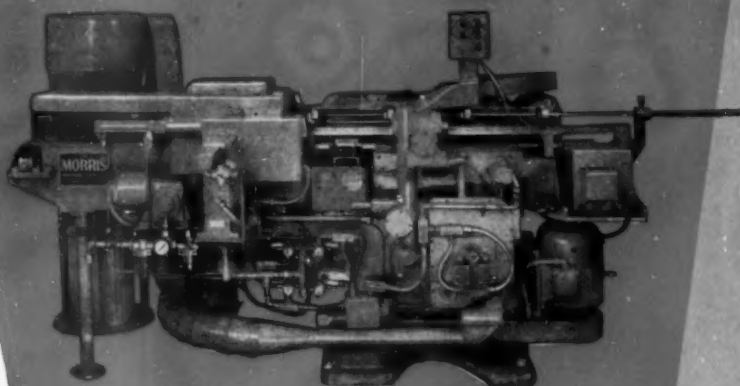


MORRIS MOR-SPEED RADIAL DRILLS

4 SIZES - 2 NEW UNITS
Centralized Controls

A complete line of heavy and light production radial drills feature centralized controls for ease of operation, fast production. Two new models utilize hydraulic control for push-button operation and pre-selected feeds and speeds . . . the easiest, fastest operation ever available.

MORRIS AUTOMATIC BALANCING MACHINES



**all
new**

COMPLETELY AUTOMATIC: from load to unload, these machines produce up to 720 perfectly balanced pistons every hour. Units are balanced within one gram plus or minus for extreme accuracy required in finished product.

MACHINE TOOLS

*Designed for Production **PLUS** Precision*

NEW . . . with proven performance, that's the story of these up-to-the-minute models of MORRIS Machine Tools. For more than 40 years, MORRIS has designed and manufactured high speed, precision equipment. The new models displayed on these two pages are the latest in a series of machine tools that have won the favor of the nation's leading manufacturers.

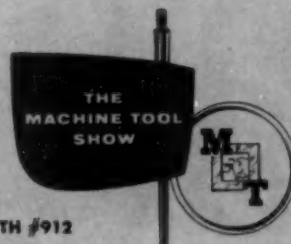
Your built-in benefit with these new MORRIS Mor-Speed Machine Tools is precise work at high speeds. Make your own comparison of MORRIS features with those of any unit. You'll see why the leaders demand MORRIS!

MORRIS MOR-SPEED MACHINE TOOLS have been selected by the world's leading manufacturers for low-cost mass production of precision-made parts and assemblies. Complete case history data is available FREE upon request.

Write today for catalogs concerning specific machines. If you prefer, outline your production problem. MORRIS engineers will make recommendations for its best solution.



Morris



VISIT US AT BOOTH #912

The Machine Tool Show

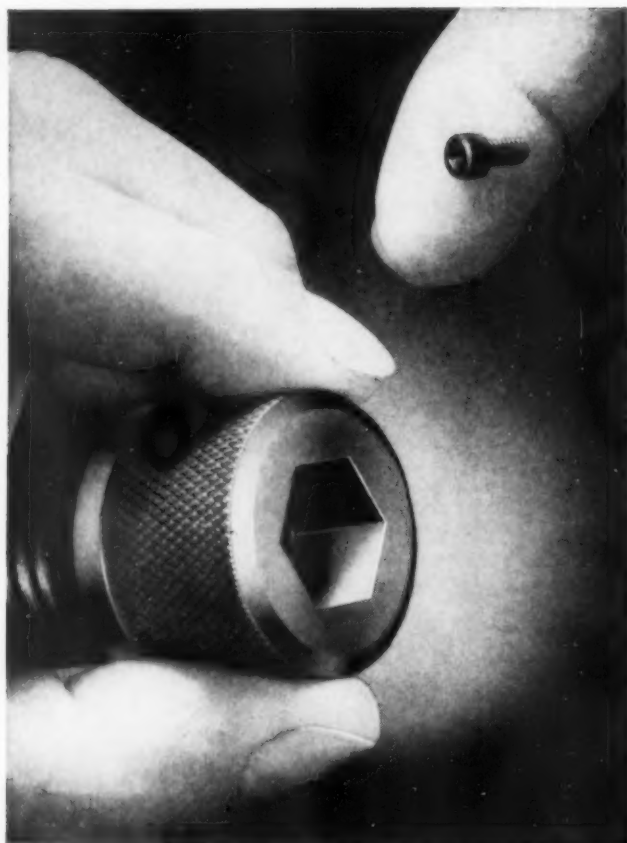
Chicago, Illinois

Sept. 6-17, 1955

International Amphitheater

THE MORRIS MACHINE TOOL COMPANY

950 HARRIET STREET, CINCINNATI 3, OHIO, U. S. A.



Sizes from 1½ inch to No. 0 wire size.

Bristol Hex Socket Cap Screws mark your product "precision made"

The high quality and pleasing appearance of Bristol's Hex Socket Cap Screws will reflect the precision you've built into your product.

Perfectly squared-up heads and shoulders of these screws give them a smooth, accurate, and well-designed look. Their diamond-knurled heads make them easier to insert, to start and to spin up finger-tight. And, of course, they can be internally wrenched up permanently tight.

We've made precision instruments at Bristol for 66 years and socket screws for more than 42. In fact, we originated the famous Bristol Multiple-Spline Socket Screw. That's why we know Bristol Hex Socket Cap Screws can meet your design or assembly needs exactly.

Standard Bristol's Hex Socket Cap Screws conform to Class 3A fit. They're standard in stainless steel and heat-treated special alloy steel.

Write today for descriptive literature and samples.

A.5.7

LARGE AND SMALL—WE MAKE THEM ALL



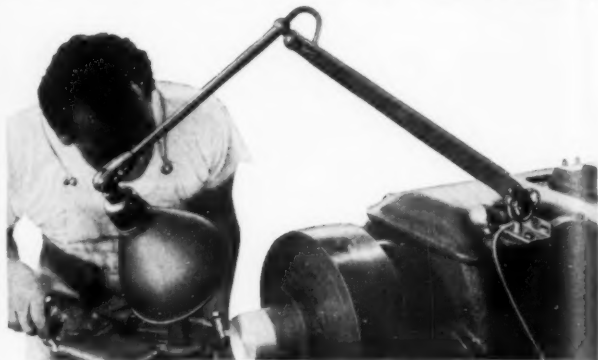
Standard in sizes as small as No. 0 in Alloy Steel and Stainless Steel.

THE BRISTOL COMPANY, Socket Screw Division, Waterbury 20, Conn.

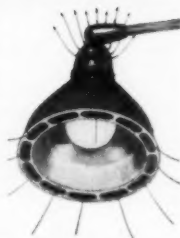
Visit us at Booth 640, Production Engineering Show, Chicago
USE READER SERVICE CARD; INDICATE A-9-294-1

294

New Adjustable-Arm *Air-Cooled* Dazors Light Machines and Benches at Low Cost



Get cool, efficient lighting with this new Dazor-quality fixture. Holds fast in any desired position, despite vibration or shock. Easily attached. Top-mounted reflector shown above—either 31" arm extension (No. 1100) or 20" (No. 1101). Also side-mounted model. Gray baked enamel over bonderizing. Call your Dazor distributor. Dazor Manufacturing Corp., St. Louis 10, Mo.



... Makers of

DAZOR FLOATING LAMPS

USE READER SERVICE CARD; INDICATE A-9-294-2

GAMMONS REAMERS ★

Originators and
Manufacturers of
Helical Reamers
and End Mills



Helical Taper
Pin Reamers
Shipped by
Return Mail

The
GAMMONS-HOAGLUND
Company

400 Main Street, Manchester, Conn.

USE READER SERVICE CARD; INDICATE A-9-294-3

The Tool Engineer

DE Vlieg

OF DETROIT

brings you a new addition to the
Famous Microbore Line
OF PRECISION TOOLING

the perfect combination...

MICROBORE
FLASH CHANGE
TOOL HOLDERS

Microbore®
PRECISION TOOLING



*Tools changed in seconds!
Positive repositioning
of boring bars!
Fast and accurate
setting of boring tools!*

**A proven
quick change
tooling system**

**FOR USE ON ALL TYPES OF
BORING MACHINES and MILLING MACHINES**

DE Vlieg MICROBORE CO., 2720 West Fourteen Mile Rd., Royal Oak, Mich.

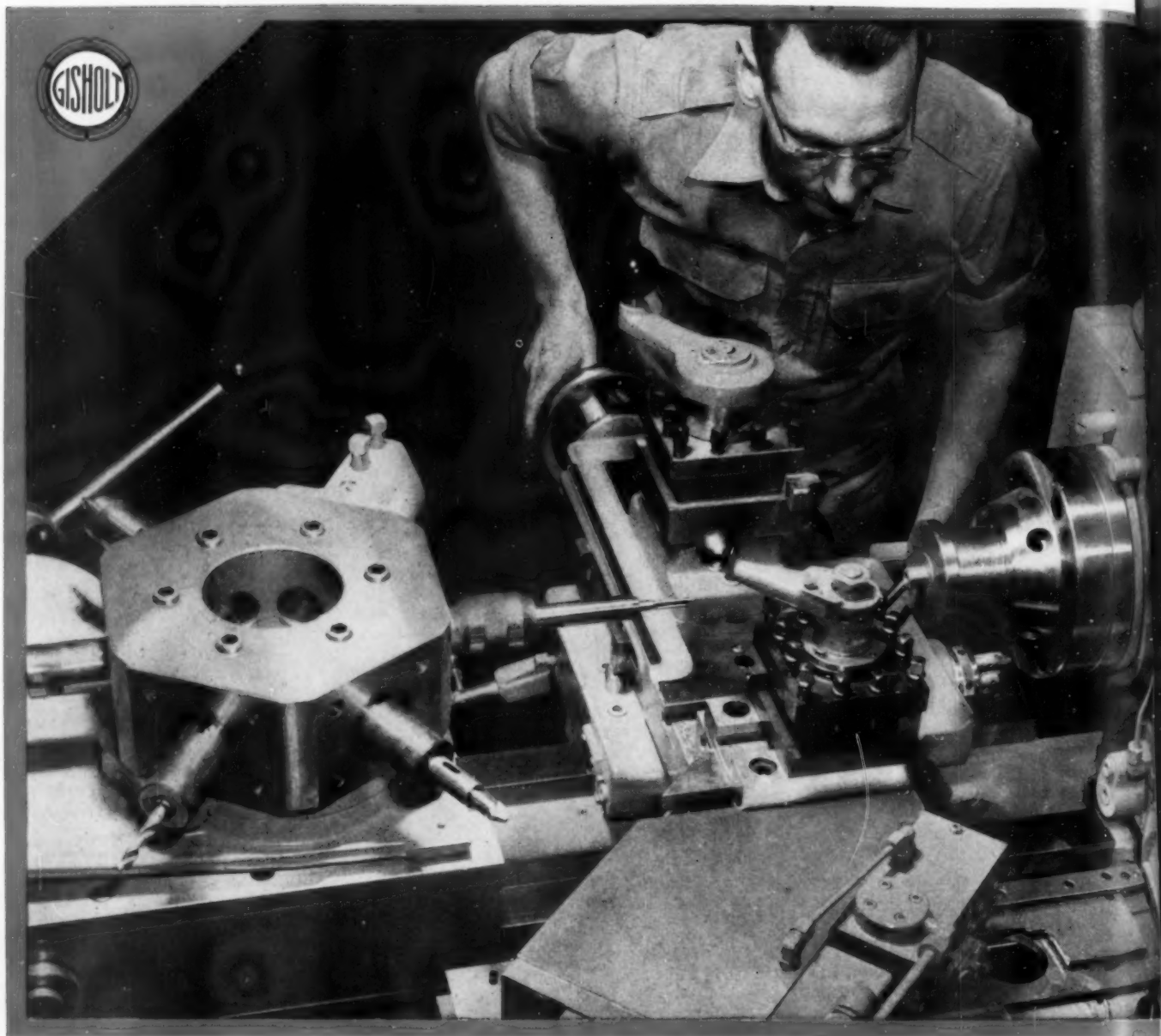
For General Purpose Work and Production Applications . . .

- A comprehensive range of Standard Microbore Flash-Change boring and milling equipment is available for tool work and general purpose machining.
- A complete service is available for engineering and manufacturing special Microbore Flash-Change equipment for all types of production operations.
- A new complete manual of application data to assist the tool engineer will be furnished on request.

Manufacturers' Representatives:
A few desirable territories
are being opened to qualified
representatives. Please write
for detailed information.

DE Vlieg MICROBORE CO. • 2720 WEST FOURTEEN MILE RD., ROYAL OAK, MICHIGAN

Turret lathe output and with Scully-Jones



**SCULLY
JONES**

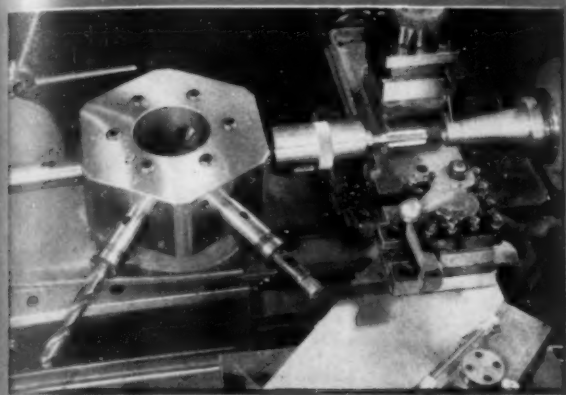
**"Precision Holding" solves diversified tooling
problems on Gisholt Turret Lathe**

This Gisholt No. 5 Ram Type Turret Lathe—a machine that's truly easy to operate—is equipped with hydraulic tracer and nine different Scully-Jones "Precision Holding" Tools in the hex turret (for two setups). It will be exhibited by Gisholt Machine Company in Chicago next September at the Machine Tool Show—Booth No. 1413.

See this exciting demonstration of accuracy and high production on a Gisholt Lathe performing 11 diversified operations on two ends of Scully-Jones Shell End Mill Arbors.

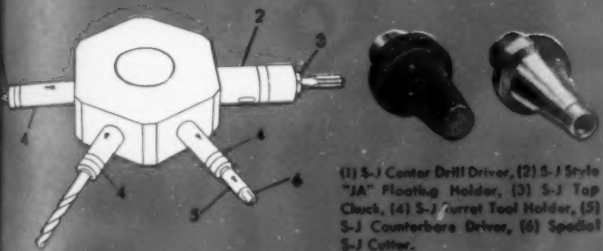
accuracy assured . . .

holders in the hex turret

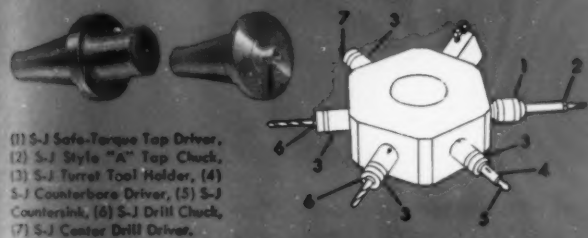


(Above) Gisholt JETRACER controls turning and facing operations on O. D. of taper shank and flange—roughing, semi-finishing, and finishing rough steel forgings with split-second precision. Scully-Jones Holders and Cutting Tools are used for center-drilling, drilling, counterboring and threading operations. (Left) Pilot ends are center-drilled, drilled, counterbored, and threaded.

TOOLING FOR SHANK END



TOOLING FOR PILOT END



Take full advantage of turret lathe accuracy and productivity, reduce tooling costs, and make the job easier by putting Scully-Jones Holders in the hex turret

Look at the *extra* gains on this job! Turret Tool Holders and Counterbore Drivers have the new "Keyhole" drift slots—an exclusive Scully-Jones feature—which make tool changes faster, easier, and safer. With the "Keyhole" ejection method, possible tool and machine damage is eliminated. Powerful pressure is exerted directly behind the tool simply by turning the camshaped ejector.

The Safe-Torque Tap Driver—another new Scully-Jones tool—increases tap life greatly (as high as 500% on some jobs), permits tapping at full speed to full depth, and helps produce more uniform, accurate threads.

And Scully-Jones Drill and Tap Chucks, with improved 4-slot design, provide increased resistance to pull-out, improved seating and collet action, more protection against tool breakage and production shutdowns.

Not only do Scully-Jones tools give you *more than* a sureness, a greater measure of accuracy, a new factor of dependability that puts a "Scully-Jones-equipped" turret lathe in a cost class all by itself.

So, when you buy or *retool* a machine tool, make sure it's equipped with Scully-Jones "Precision Holding" Tools. Call your Scully-Jones representative or distributor—factory-trained "Precision Tool and Work Holding Specialist"—for information and service.



SCULLY-JONES

"Precision Holding" for holding precision

Scully-Jones and Company, 1915 S. Rockwell Street, Chicago 8, Illinois

Safe-Torque
Tap Drivers

Drill and
Tap Chucks

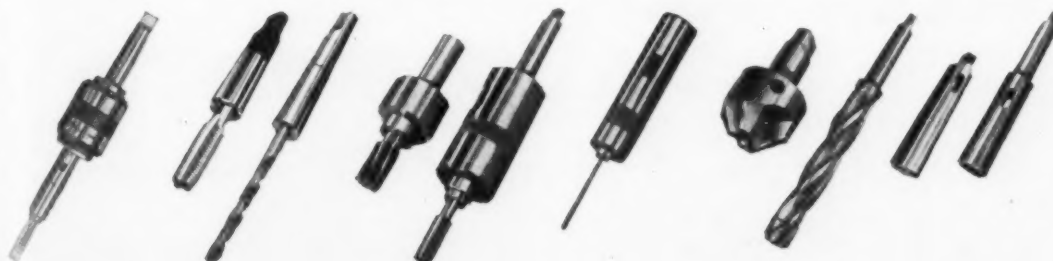
Floating
Holders

Turret
Tool Holders

Cutting Tools
and Holders

Sleeves
and Sockets

New "Keyhole"
Tool Ejection Method



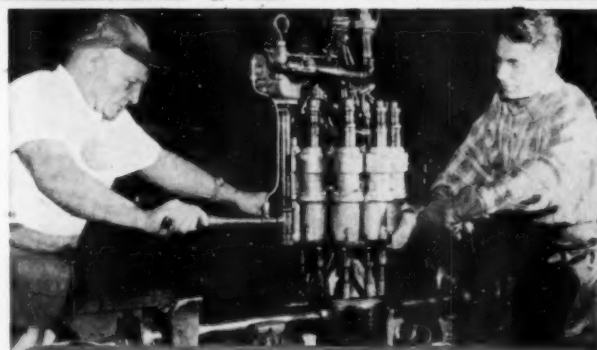
Fast, Accurate Nut Setting with MULTIPLE SPINDLES



Multiple nut setters bolt down cylinder heads in automobile engine assembly. Torque output of each spindle is individually adjustable.

Where bolts or nuts can be run and tightened two or more at a time, Keller Multiple Nut Setters increase output and reduce costs. Even more important, they improve quality control by keeping torque within very close tolerances.

The automotive industry—and many others—are making extensive use of these tools. For detailed information contact your nearest Keller sales office. Descriptive Bulletin 16-101 sent free on request.



Ten bolts are run simultaneously to attach axle carrier to differential housing. Accurate torque is vital because the joint must be leakproof.

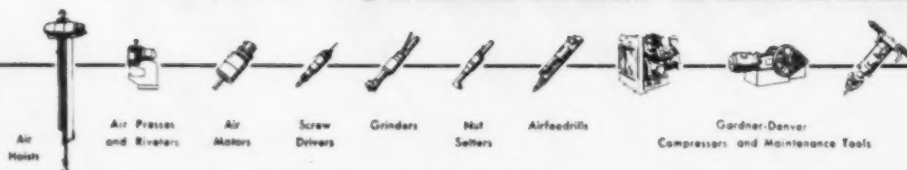


KELLER TOOL

DIVISION OF

GARDNER-DENVER

GRAND HAVEN, MICHIGAN





**They're SUPER accurate, They're SUPER finished
They're SUPERMETRIC**

Precision ground all over — including cam lug and key way slots — SUPERMETRIC chasers match the famed precision of GEOMETRIC heads. Together they guarantee precision threading. Only GEOMETRIC offers SUPERMETRIC.

Greenfield Tap and Die Corporation

GEOMETRIC TOOL COMPANY DIVISION

NEW HAVEN 15, CONNECTICUT

SEE OUR LITERATURE — BOWEN 222 — MACHINING TOOL BOOK

HOW TO BUY CENTERLESS WHEELS

FOR FASTER PRODUCTION AT LOWER COST

*...and get "More Use
per Dollar"*

Look for a rubber bonded wheel that permits both roughing and finishing... at higher grinding speeds.

To do two jobs efficiently—roughing and finishing—the centerless wheel you buy should have a high grit-carrying bond that will insure maximum metal removal with every pass. A high grit-to-bond ratio produces a fast, free cutting wheel that needs fewer dressings. The rubber bond should also be able to produce desired finishes to required tolerances, even with coarse-grained abrasives. A wheel with these characteristics enables you to do both roughing and finishing operations, simply by controlling the feed rate and the amount of rough stock removed... without time consuming wheel changes. In addition, if the wheel is strong enough to permit high speed operation, you can realize substantial savings in production time and costs.

Specify the centerless wheels that give you all these features... specify Manhattan Rubber Bonded Centerless Wheels.



MANHATTAN CENTERLESS WHEELS

Manhattan Centerless Grinding and Regulating Wheels are custom-made in the abrasive and bond required for your operations. By using Manhattan Centerless Wheels you are assured heavier metal removal per pass, close tolerances and superior finishes... a better job, faster—at lower cost. Their greater strength allows grinding speeds up to 8500 sfpm. Manhattan Regulating

Wheels are supplied either plain or core-mounted. Manhattan Core Mountings provide substantial wheel savings.

Ask your Manhattan representative to show you how Manhattan Centerless Wheels and other high speed, heavy duty abrasive wheels last much longer... give you "More Use per Dollar".

RM-530



WRITE TO ABRASIVE WHEEL DEPARTMENT
MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Flat Belts



V-Belts



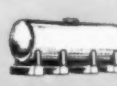
Conveyor Belts



Hose



Roll Covering



Tank Lining



Abrasive Wheels

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls



NEW BRITAIN

Automatics



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approaches to
more profitable
metalworking**

LUCAS
of Cleveland



**THE
MACHINE TOOL
SHOW**

**CHICAGO, ILL.
SEPT. 6-17, 1955**

INTERNATIONAL AMPHITHEATRE



Automatic Bar and Chucking Machines;
Precision Boring Machines;
Copying Lathes; Horizontal Boring,
Drilling, and Milling Machines.

**BOOTH
1419**

The NEW BRITAIN MACHINE COMPANY

New Britain-Gridley Machine Division, New Britain, Connecticut • Lucas Machine Division, Cleveland 8, Ohio



SKILLED HANDS EXPEDITE ORDERS... AT UDDEHOLM

Here is a typical example:

TOOL STEEL—ONE GRADE—36 SIZES

The minute the Telephone Salesman picked up the phone, he knew he had a tough rush-order on his hands. The customer wanted 36 sizes of UHB 46 OIL-HARDENING ANNEALED TOOL STEEL from stock! Quickly checking his stock list, he gave the buyer the standard Uddeholm answer: "Can do..."

ALMOST FOUR TONS

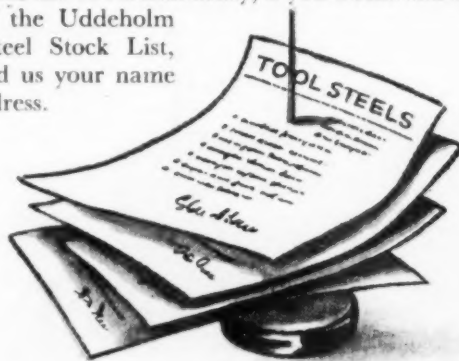
When the Warehouse Foreman got the order from the front office, he added up the weight... 7588 pounds... with sizes ranging from 1/4" square through 6" round to 2" x 12".

ONE-DAY DELIVERY

Noting that the Foreman had marked the order "PRIORITY", the Warehousemen quickly located the items and marked them for immediate shipment. Twenty-four hours from the time the order was entered, the delivery truck rolled up to the customer's unloading platform!

SERVICE

Uddeholm warehouses are service-minded. No matter how large or how small the order, it receives immediate attention. We feel that it is our duty to meet delivery dates. The next time you are in the market for quality tool steel, why don't you get in touch with us?... Incidentally, if you would like a copy of the Uddeholm Tool Steel Stock List, just send us your name and address.



UDDEHOLM COMPANY OF AMERICA, INC.

Tool and Die Steels
Specialty Strip Steels

Offices and
Warehouses

New York: 155 East 44th Street, Murray Hill 7-4575

Cleveland: 4540 East 71st Street, Diamond 1-1110

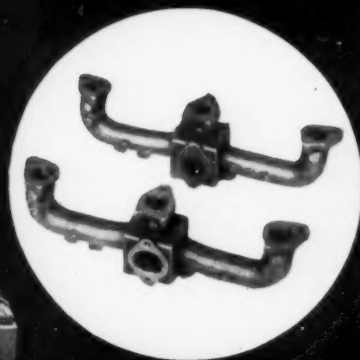
Los Angeles: 5037 Telegraph Road, Angelus 2-5121

District Representatives: DETROIT: Warren H. Nugent, 17304 Lahser Rd., Kenwood 5-6340 • CHICAGO: Frank J. Mackin, Leroy E. Marshall, 55 E. Washington, State 2-1649 • TORONTO: Uddeholm (Canada) Ltd., 95 King St. East, Empire 6-1033

ANOTHER EXAMPLE of
REDUCING COSTS WITH—

Buhr

ECONOMATION



Mills, core-drills, drills,
countersinks and individual-
lead-screw taps 206 intake
manifolds an hour gross!

Economy and automation are combined in this Special to form another example of the way Buhr *Economation* reduces production costs for leading manufacturers.

This 6-way dial-type hydraulic-feed Buhr Special is equipped with a 72"-diameter 8-position automatic index table, complete with

shot bolt.

Chip disposal is accomplished by an automatic rotating chip conveyor, attached to index.

Operations formerly accomplished by eight machines were combined in this Buhr Special—and volume of production was increased! . . . A typical example of Buhr *Economation*!

See what Buhr *Economation* can do to reduce your production costs. A phone call, wire or letter will bring you a prompt consultation with one of our top sales executives.

BUHR MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

Buhr

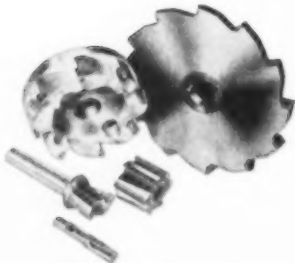
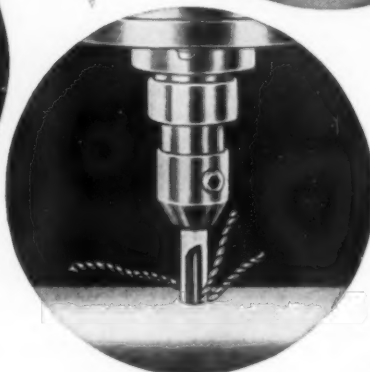
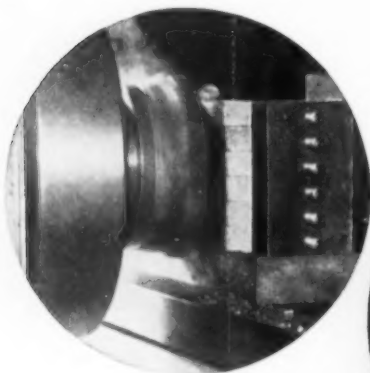
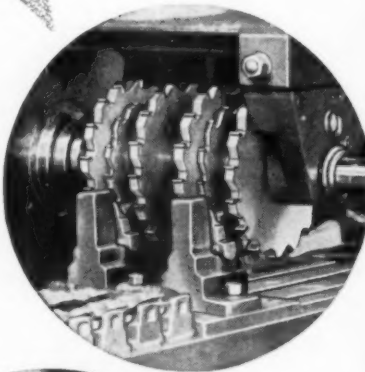
MULTIPLE-SPINDLE
HIGH PRODUCTION MACHINERY

Solidly Engineered • Precision Built • for World's Leading Manufacturers

HERE'S THE "Payoff Point" ON ANY MACHINE!

Production speed,
product quality
and economy
depend on one
single factor—
THE TOOLING IN
THE MACHINE!

Nelco carbide tipped tools make any machine tool more efficient, more productive. On a new machine, Nelco tools give maximum performance. The tool, and be sure it's Nelco, is the PAYOFF POINT on any machining operation. Nelco tools are built to cut—and keep on cutting—to close tolerances and schedules. Finishes are finer; downtime reduced; a size and type for every job a proven fact. For that extra edge in production in new machine or old, look to Nelco at the PAYOFF POINT.



SEND TODAY FOR THE NEW
NELCO CATALOG—over 850
standard cost cutting, time cutting
carbide tools.



NELCO TOOLS

- FACE MILLS
- SLAB MILLS
- BORING BARS
- SPECIAL TOOLS
- SLITTING SAWS
- HALF SIDE MILLS
- KEYSEAT CUTTERS
- DIAMOND WHEELS
- SHELL END MILLS
- TRI-HELIX FACE MILLS
- HARDENED STEEL DRILLS
- FINE PITCH FACE MILLS
- SOLID CARBIDE REAMERS
- CARBIDE TIPPED TAPER SHANK CHUCKING REAMERS
- CARBIDE TIPPED STRAIGHT SHANK CHUCKING REAMERS
- 2 FLUTE DOUBLE END SOLID CARBIDE END MILLS
- 4 FLUTE DOUBLE END SOLID CARBIDE END MILLS
- 3 FLUTE CARBIDE TIPPED CENTER CUTTING END MILLS
- SOLID CARBIDE TWIST DRILLS
- No. 50 TAPER SHANK END MILLS
- INSERTED BLADE FACE MILLS
- GRINDER AND LATHE CENTERS
- CARBIDE TIPPED TWIST DRILLS
- TRI-HELIX SIDE MILLING CUTTERS
- 2 FLUTE CARBIDE TIPPED END MILLS
- 2 FLUTE SOLID CARBIDE END MILLS
- 3 FLUTE CARBIDE TIPPED END MILLS
- 4 FLUTE CARBIDE TIPPED END MILLS
- 4 FLUTE SOLID CARBIDE END MILLS
- TYPE C SHELL MILLING CUTTER ARBORS

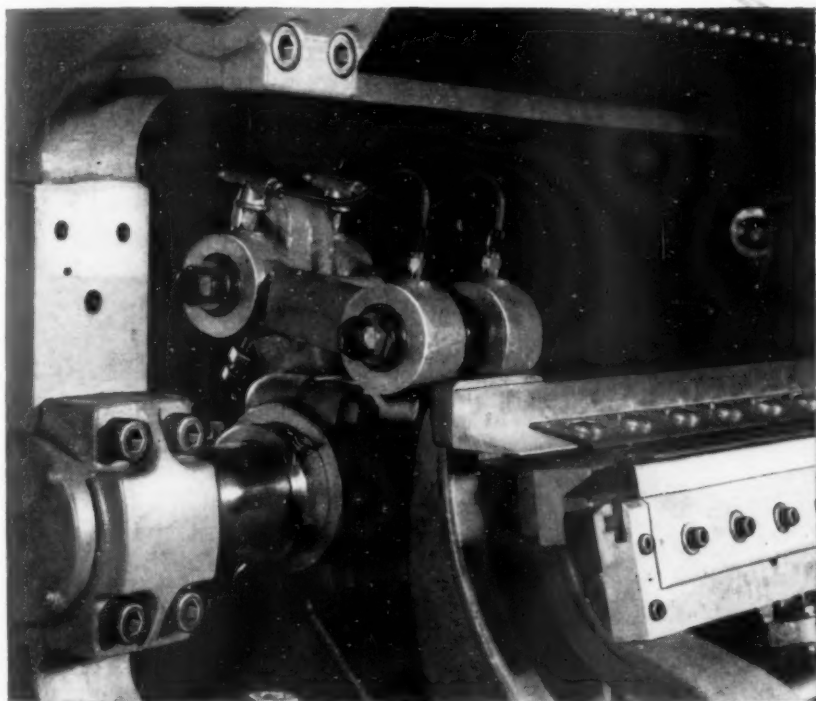
NELCO TOOLS

NELCO TOOL CO., Inc. • Manchester, Connecticut

For that **EXTRA** Edge in Production!

P-K "proving ground" for

ASSEMBLY STRENGTH



STAY TIGHT UNDER TOUGHEST CONDITIONS

In the warp knitting machine, above, P-K Socket Screws stay tight under constant vibration. Some of many different P-K Socket Screws used are shown — P-K Cap Screws in shaft bearing pads and needle bar clamps, and P-K Set Screw in collar on needle bar rocker shaft.

The "proving ground" for the holding power of P-K Socket Screws is industry-wide. Millions of assemblies made by thousands of satisfied customers are your assurance that screws made to P-K quality standards meet every test.

In many of these assemblies, P-K Socket Screws are subjected to extreme conditions of shock and vibration . . . such as ordnance and other products made to exacting demands of the Armed Forces.

Get samples, information from your P-K Distributor, or write:
Parker Kalon Division, General
American Transportation Corporation,
200 Varick St., New York 14.

PARKER-KALON®

SOCKET SCREWS



Remember

P-K means

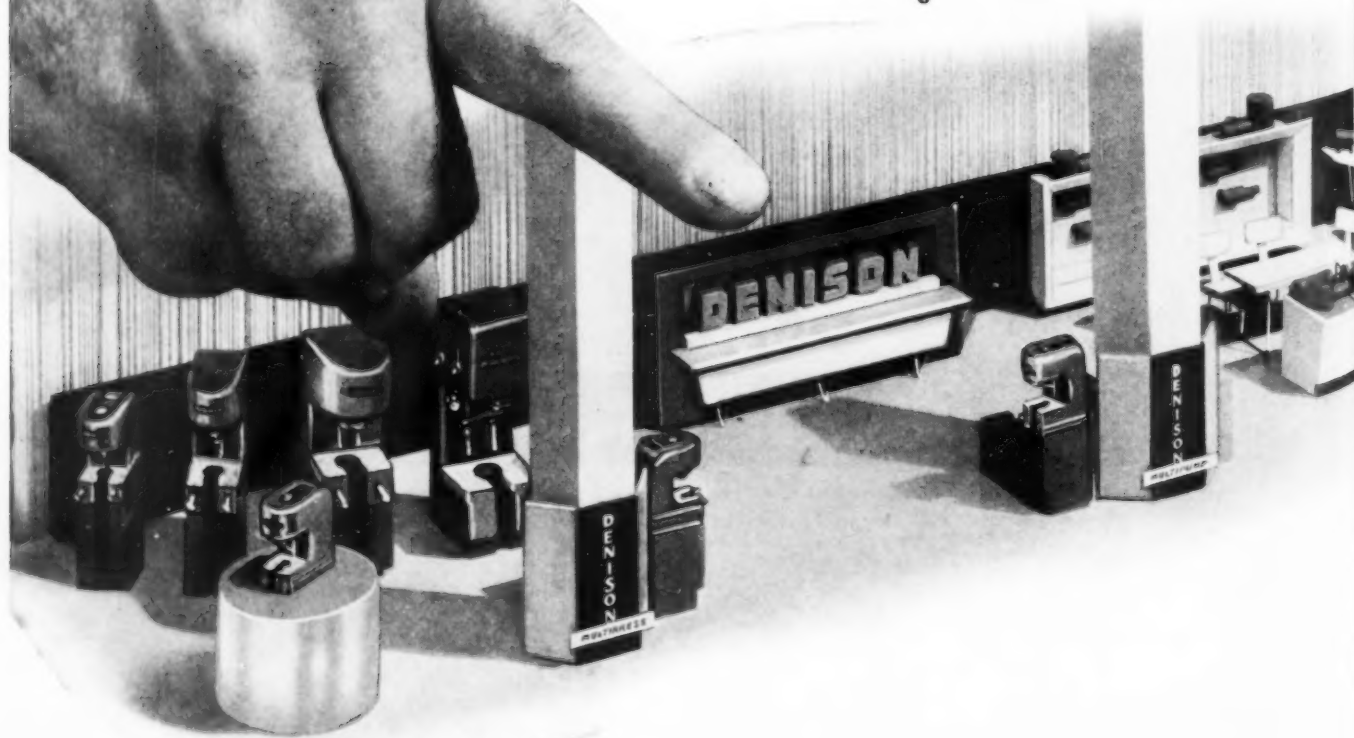
OK





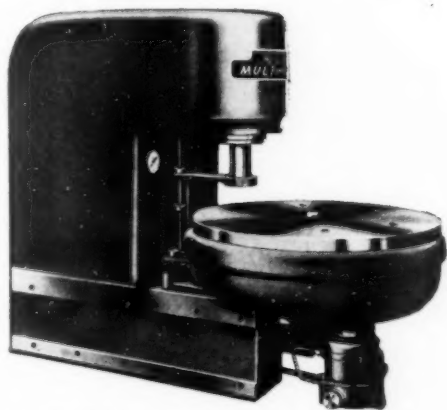
TO FIND to all

VISIT US AT
BOOTH 819

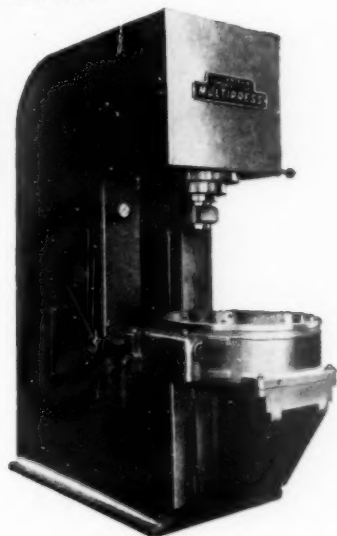
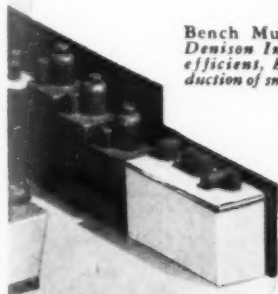


THE ANSWERS your pressing needs

**YOUR KEY TO AUTOMATION ON ASSEMBLING • RIVETING
DRAWING • PUNCHING • MARKING • TRIMMING • PELLETING
COMPACTING • TESTING • STRAIGHTENING • BROACHING • SWAGING**



Bench Multipress with
Denison Index Table for
efficient, high-speed pro-
duction of small, light parts.



75-ton Multipress with Denison Index
Table for automatic production of heavy parts.

SEE HOW DENISON'S *faster cycle time*

- speeds production
- simplifies operations
- makes products better . . . yet cuts costs

SEE DENISON LINE OF MULTIPRESS

demonstrated with

Index Tables Stock Feeds Hydraulic Servo Controls
for automatic and semi-automatic operation

SOMETHING EXTRA FOR AUTOMATION ENGINEERS

Newest developments in hydraulic pumps, motors and controls are being demonstrated and displayed to benefit machine designers, equipment builders and production engineers. A Denison hydraulic engineer will explain how you can simplify your circuits, build greater dependability into your hydraulics . . . and at the same time cut costs.

BRING YOUR PRESS PROBLEMS ALONG.

LET US HELP YOU SOLVE THEM

with DENISON HYDRAULIC MULTIPRESS

THE

DENISON ENGINEERING COMPANY

1182 Dublin Road

Columbus 16, Ohio

Subsidiary of American Brake Shoe Co.



ARTER

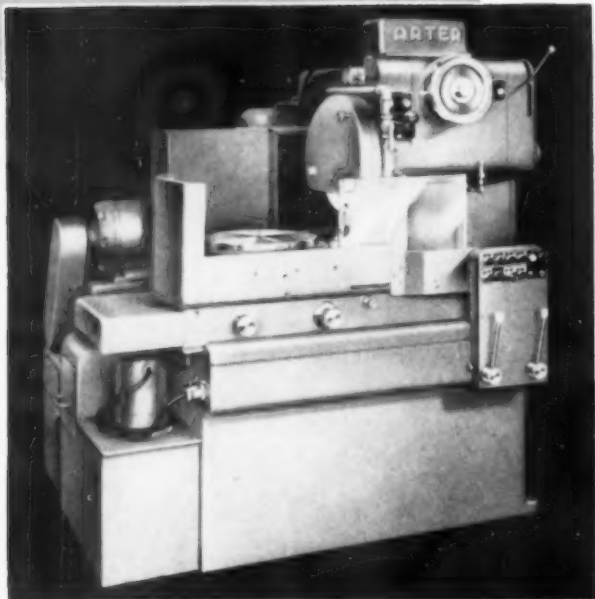
FAMILY OF GRINDERS

at the

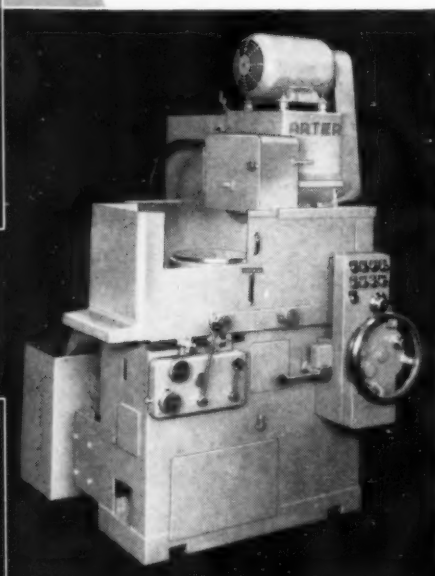
MACHINE TOOL SHOW

Sept. 6-17 • Booth 1308

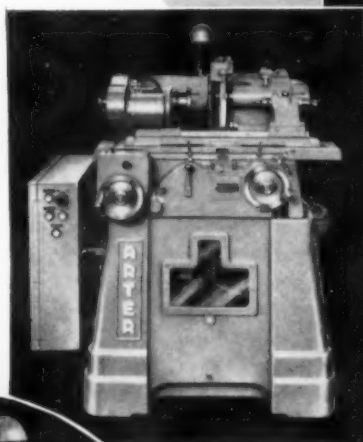
A GENERATION of experience stands behind the ARTER family of grinding machines. Progressively these machines have attained advanced techniques, simplification of grinding processes, closer tolerances. Today ARTER is proud of the family including the newest members, Models E and F Rotary Surface Grinders, making their bows at the Tool Show.



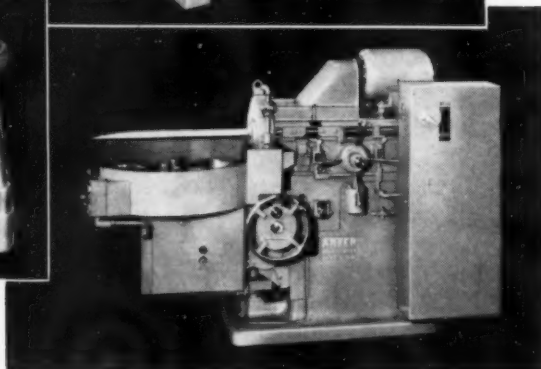
MODEL E—12" AND 16"
ROTARY SURFACE GRINDER



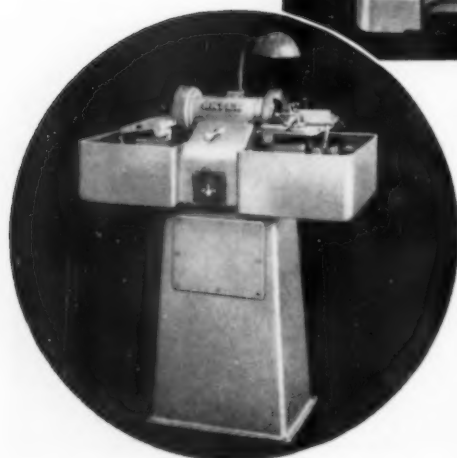
MODEL F 12"
ROTARY SURFACE
GRINDER



MODEL 103—
CYLINDRICAL AND
INTERNAL GRINDER



MODEL D—SPECIAL
SEMI-AUTOMATIC
ROTARY SURFACE
GRINDER
ARRANGED WITH
WORK-LOADING
AND PUSH BUTTON
GRINDER CYCLE



MODEL 200
CARBIDE TOOL GRINDER

ARTER GRINDING MACHINE CO.
WORCESTER • MASSACHUSETTS

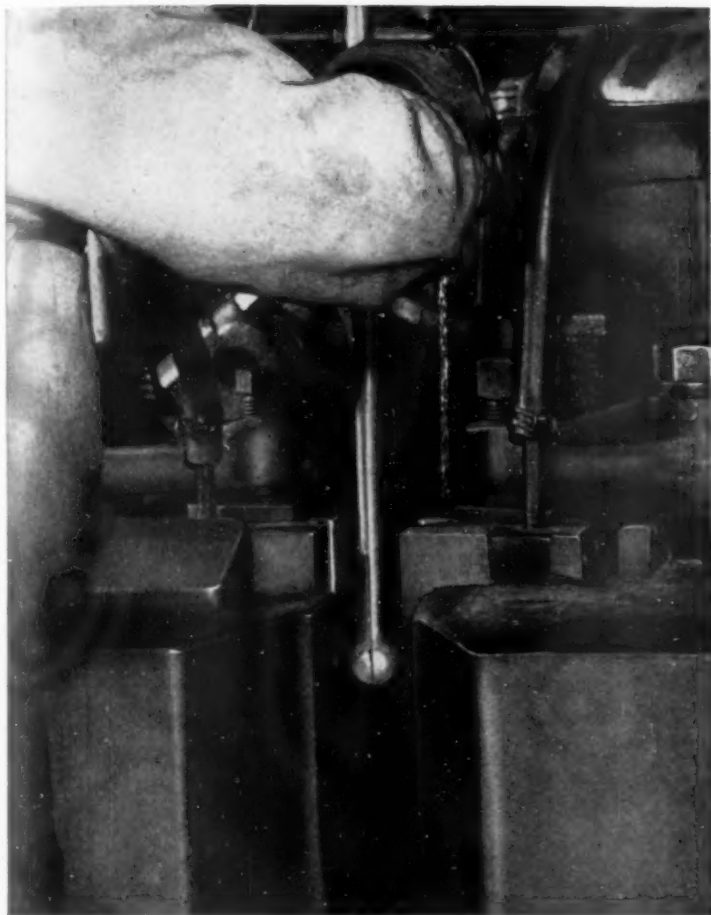
Agents in industrial centers of United States and Canada



Tool Steel Topics



BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.



Forging Die of Cr-Mo-W Produces 2000 Steering Links Daily

This is the business end of a hot forging die, used in a West Coast plant to produce socket forgings for automobile steering-linkage assemblies. A typical steering link is shown after the first blow in the multiple-station die, made of Bethlehem Cr-Mo-W (chrome-moly-tungsten) tool steel.

The Cr-Mo-W die, hardened to Rockwell C 52-56, shapes hot-rolled 23/32-in. rounds of 1030 steel at the rate of 300 pieces per hour, producing approximately 30,000 pieces before reworking is required. It is then machined and re-treated, resulting in long service life.

Bethlehem Cr-Mo-W is a general-purpose hot-work tool steel, with a 5 pct chromium content, plus moly and tungsten. It is ideal for jobs involving shock or radical changes of temperature. It hardens in air for exceptional resistance to distortion during heat-treatment. It has good red-hardness, which provides resistance to heat-checking. Cr-Mo-W also machines easily, as it can be annealed to 217 Brinell.

Cr-Mo-W is used extensively for applications such as trimmer dies, die-casting dies, hot-shear blades, and various types of punches. Why not look into this fine tool steel? Your nearest Bethlehem tool-steel distributor will be pleased to furnish full information. He can offer good delivery, too.



BETHLEHEM TOOL STEEL ENGINEER SAYS:

How to Machine Heat-Treated Tools

Machining hot-work tools and plastic and die-casting molds directly from bar stock heat-treated to Rockwell C 30-45 presents many a problem.

Carbide tools are preferred, though they require careful handling. Due to the high hardness of the metal being cut, much heat is generated during machining, causing the carbide tools to wear rapidly. To cut pre-hardened tool steels in turning, boring, planing and milling operations, use speeds of from 60 to 120 surface ft per min.

High-speed steels can be used in such operations with cutting speeds of 15-25 surface ft per min, though tool life will be short. Conventional drills of high-speed steel are satisfactory if the cutting speed is slowed. Conventional tapping of threads rarely succeeds, single-point lathe tools being used instead.

The advantages of pre-hardened tool-steel stock — the elimination of heat-treatment on the machined tool, and the exact control maintained over tool dimensions — must be weighed against the difficulties encountered in machining, which have frequently been considered insurmountable.



Omega Chisels Bite Deep, Stay Sharp

Because Bethlehem Omega has a normal working hardness at the cutting edge of Rockwell C 58-60, chisels made of this fine tool steel hold their sharp edge. Omega combines shock-resistance with hardness and ductility. It is easy to forge, redress, and heat-treat, and can be hardened in oil or water.

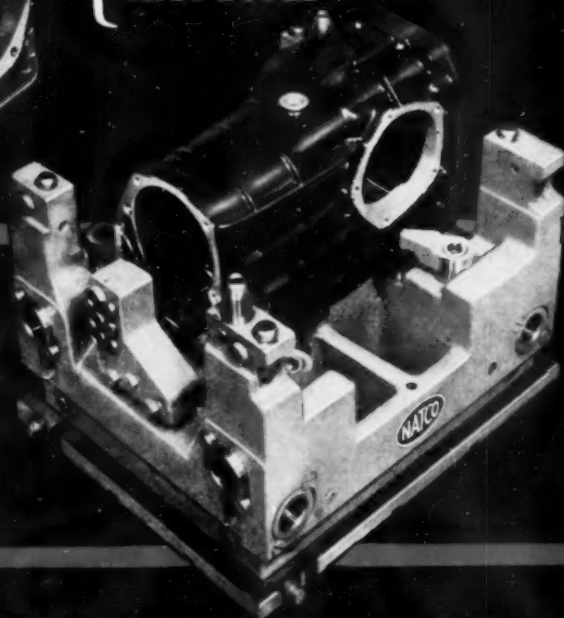
MORE TRANSMISSION CASES AT LESS COST.....

55 PARTS per HOUR



**201 OPERATIONS
ON EACH PART**
DRILLED, BORED,
REAMED, TAPPED,
SPOTFACED, CROSS-
FACED, MILLED,
CHAMFERED and
INSPECTED

Parts are loaded into individual holding units which are conveyed through the machine automatically. After machining is completed, chips are removed and the holding units pass through a washer and are returned to the first station.



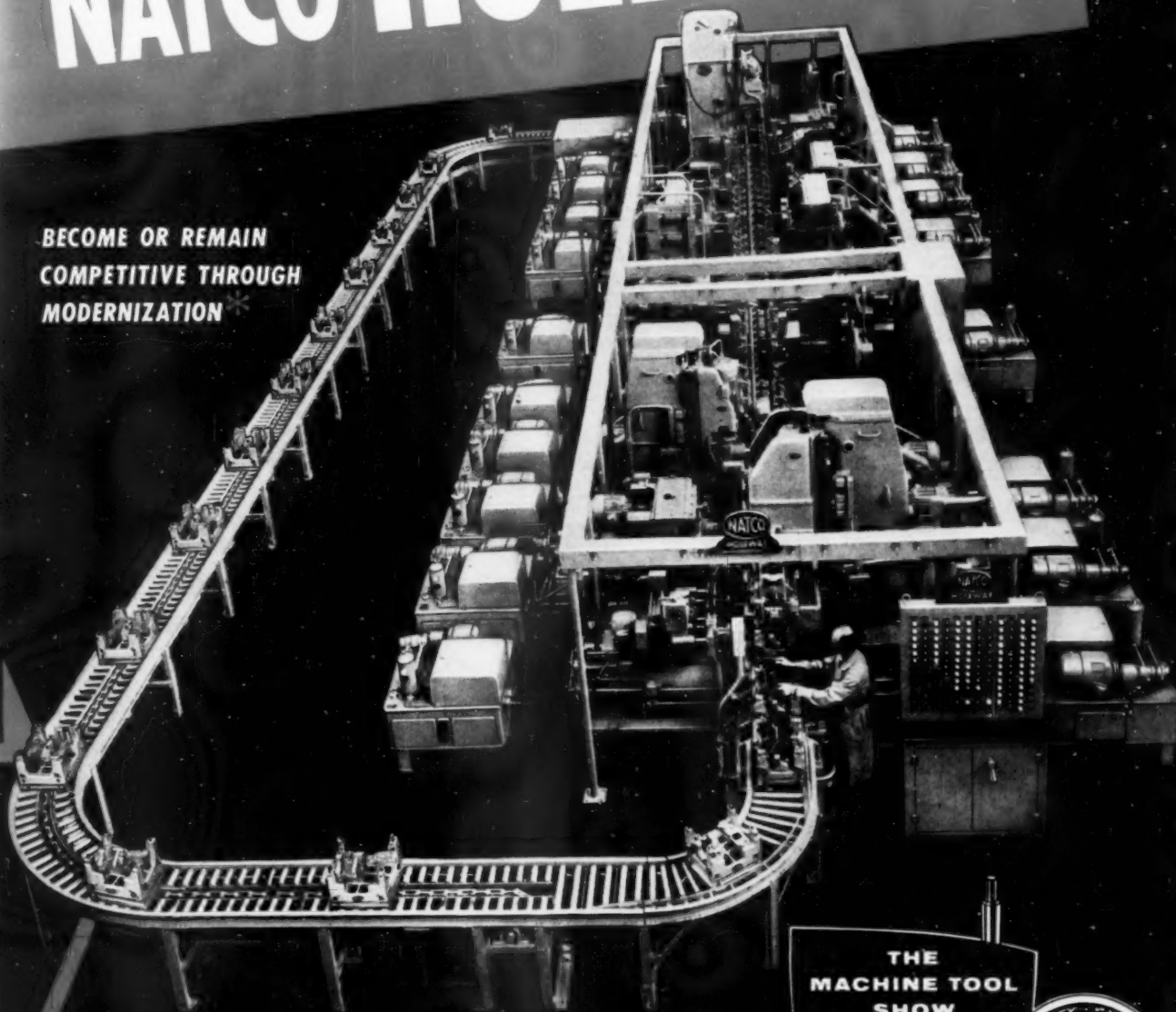
for answers to your Drilling, Boring, Facing and Tapping problems

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DETROIT, 10138 W. McNichols Rd.
BUFFALO, 1807 Elmwood Ave.
NEW YORK, 35 Beechwood Ave., Mount Vernon

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RICHMOND, INDIANA

THE
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CHICAGO, ILL.
SEPT. 6-17, 1955

INTERNATIONAL AMPHITHEATRE



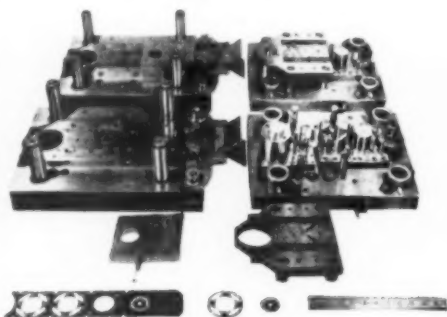
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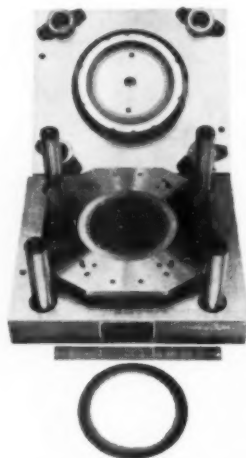
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FOR QUOTATION

TUNGSTEN CARBIDE—HIGH
CARBON — HIGH CHROME

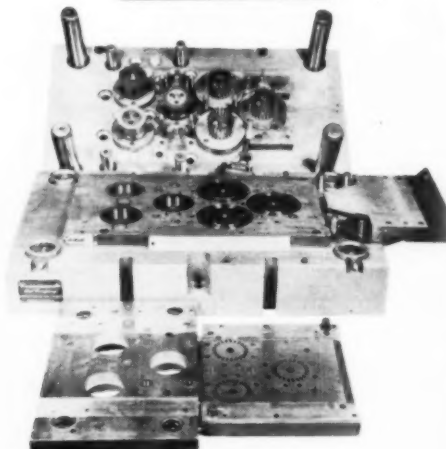
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COMMANDO TOOL INC.

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OFTEN

TWO HEADS ARE BETTER THAN ONE



Sometimes two heads are the only solution to a part or fastener problem. Take a quick look at the belt buckle roller illustrated. The big problem here was to produce this roller in quantity, inexpensively and quickly . . . and HASSALL double-heading did the trick. Double-heading is only one example of the almost limitless possibilities Hassall cold-heading offers you. If you have a fastener problem just send us samples or specifications for a quotation.

WRITE FOR CATALOG . . . with it we will send you our popular decimal equivalent wall chart.

John Hassall, Inc., Box 2185, Westbury, L. I., N. Y.

HASSALL

SINCE
1850



NAILS, RIVETS, SCREWS
AND OTHER COLD-HEADED
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THAT SPELLS PROGRESS IN

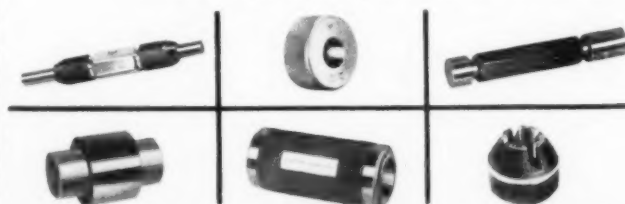
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● We are now operating our new precision gage manufacture and temperature controlled measurement laboratory in Rockford, Illinois.

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We would like to have you stop in and see us. We would like to have you meet the people who conceive, design, engineer, and manufacture REHNBERG-JACOBSON Special Machines and other products. We would like you to see the up-to-date facilities that are at our command to accomplish your purposes. The REHNBERG-JACOBSON plant is an interesting one because it does not follow the conventional pattern — just as REHNBERG-JACOBSON products are often outstanding in performance because they

employ ingenious new conceptions and new arrangements. You are welcome to visit any part of the REHNBERG-JACOBSON shop or offices that may interest you, and to talk with any of our people. One of our sales personnel or executives will be glad to guide you around. As a user of machine tools and allied products, you might like to know what facilities REHNBERG-JACOBSON has for satisfying your needs — and we want you to feel free to stop in and visit us the next time you are in ROCKFORD.



BOOTH 505



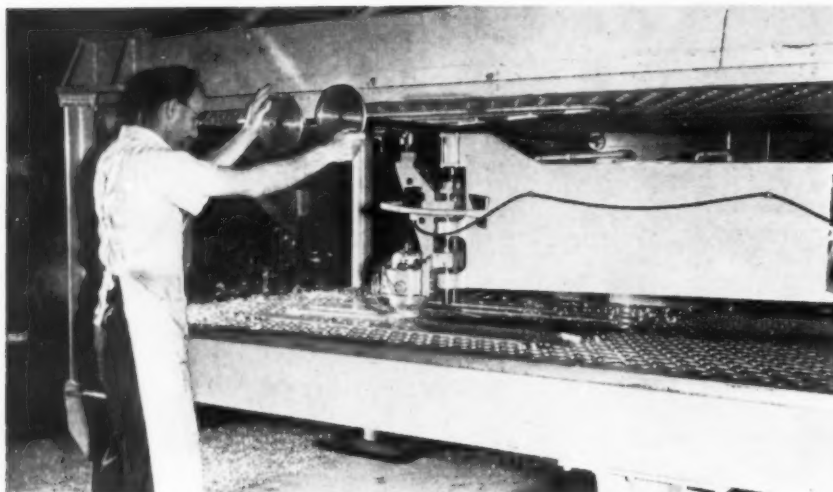
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MANUFACTURING COMPANY

Designers and Builders of Special Machinery

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100% STABILITY FOUND IN NEW VACUUM CHUCK



Octopus Grip Vacuum Chuck, developed by Convair—a Division of General Dynamics Corporation, San Diego—is shown here on a skin milling machine. Upper chuck holds pattern, lower chuck holds material. Approximately 1000 suction cups can be used to hold skin during milling operation.

Pioneer Tool Engineering, Inc., 1601 E. El Segundo Blvd., El Segundo, California is the licensed manufacturer of the Octopus Grip Vacuum Chuck.



Write for 921-T Catalog

shows complete range of applications, important mechanical properties, stock sizes and special cast sizes.

PIONEER

Formula 921-T

cast aluminum tooling plates and bars
for use in jigs, dies, fixtures and special machines.

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(See us in Booth #220 at the Metal Working Exposition, Chicago Colliseum, September 6-17)



The suction cups use removable rubber grommets. A screw in the center hole serves as a shut-off valve. This allows any shape skin to be placed on chuck without complicated sealing-off of vacuum source typical of some vacuum-type chucks.

Like all vacuum chucks, specifications for the new Octopus Grip Vacuum Chuck required a high degree of stability due to the close tolerance present in milling operations.

Engineers specified Pioneer 921-T, a specially alloyed cast aluminum tooling material.

921-T is 100% stable under all temperature conditions, lightweight, rigid, and easy to machine.

One of the leading qualifications for Pioneer 921-T's use in vacuum chucks is that it will expand and contract at the same rate of the material being milled. In addition, chucks made from 921-T are extremely lightweight and so rigid that chucks often are merely clamped down rather than bolted.

Of course, where many grooves are concerned, 921-T is ideal. It's easily machined.

Pioneer 921-T is probably the top material available for vacuum chucks.

"excellent finish"



SURVEY

DESCRIPTION OF WORK

Surface grinding tool bits
to size on production basis.

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PERFORMANCE

Excellent finish, plus long segment life.
Performance unequalled by other
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SOLID CHUCKING
REAMERS



EXPANSION REAMERS



SHELL-TYPE
EXPANSION REAMERS



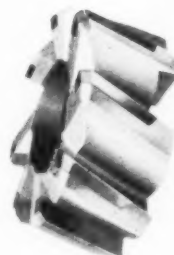
STUB SCREW MACHINE
REAMERS (SOLID AND
EXPANSION TYPES)



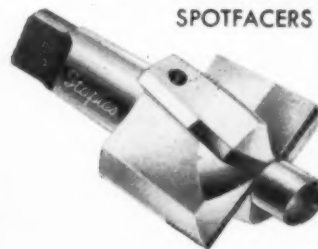
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SPOTFACERS

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A complete line of Circular Carbide-Tipped Tools, Expansion Reamers — Special Tools

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Standard Tool Catalog

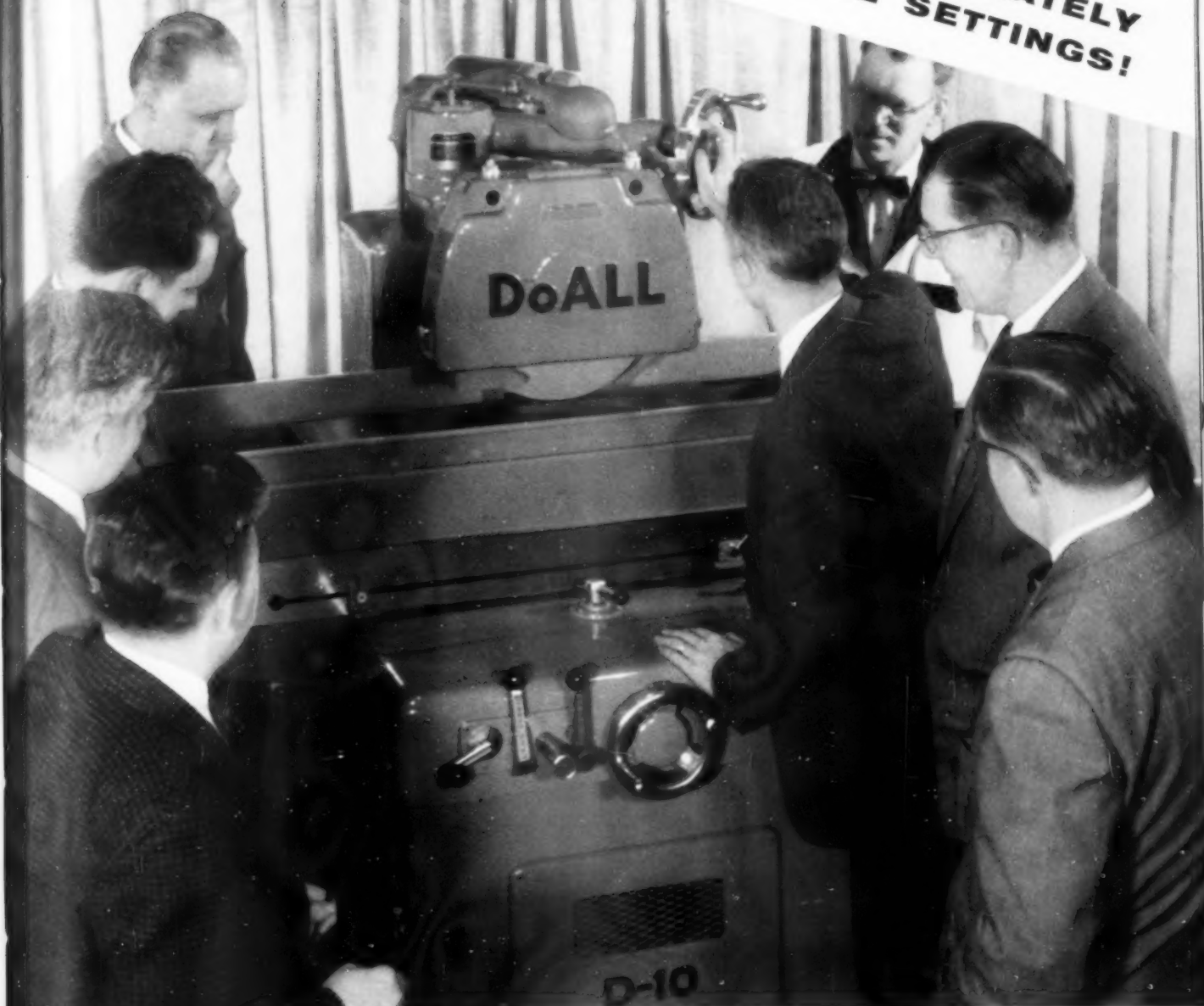
THE STAPLES TOOL COMPANY, CINCINNATI 25, OHIO

316

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-316

The Tool Engineer

**GRINDING ACCURATELY
TO HANDWHEEL SETTINGS!**



In this demonstration, men who had never before operated a surface grinder removed stock exactly to down-feed setting by following simple instructions.

How to Take the Guesswork Out of Surface Grinding!

The amount of work that can be produced per hour on a surface grinder depends upon its accuracy. To grind, measure and then grind some more to secure final dimension is a costly waste of time. With a DoALL Grinder you eliminate this loss because you can trust its feed calibration in terms of stock removal.

DoALL

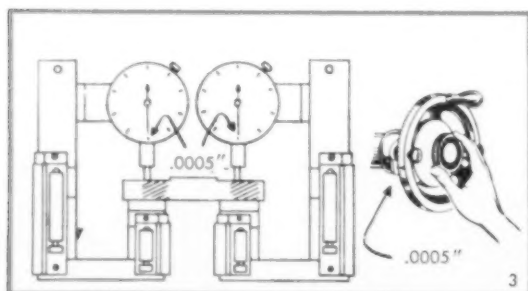
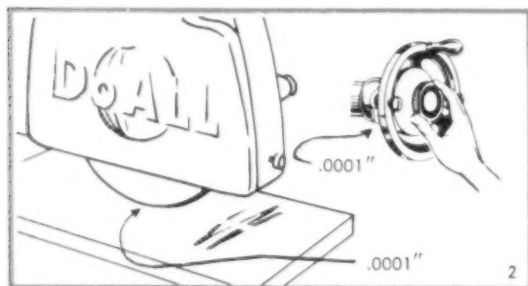
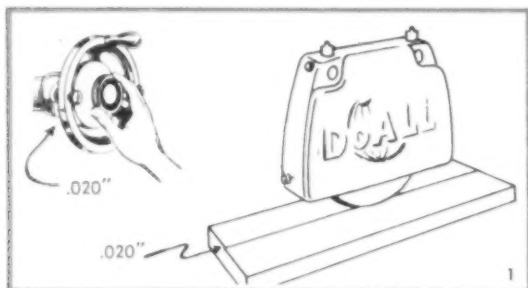
The DoALL Company
Des Plaines, Illinois

Please turn the page for details. —————>

... FEED SETTING
HERE ...



HOW TO TEST A GRINDER'S ACCURACY



Can Your Grinders Do This?

An accurate handwheel doesn't make an accurate grinder. And, you can't prove accuracy by checking distance from table to wheel when the machine isn't subject to the load of grinding. The real proof of a grinder's accuracy is its ability to remove stock *exactly* according to downfeed calibrations.

The following demonstration of a DoALL Grinder is conclusive proof of its remarkable accuracy:

1. No Spark-Out! Take a .020" cut with .020" crossfeed in a 2" x 3" piece of 59-60 RC hardness tool steel. Run the wheel back through the completed cut. There is no spark-out! Now, center the wheel over the work and stop the table travel. The rotating wheel will not mark the work!

2. Erases Pencil Mark! Now, put a pencil mark across the workpiece. Start the grinder, feed down .0001" and run the wheel through the cut again. It will erase the pencil mark!

3. Duplicates .0005" Cuts! Next, set the downfeed to take a .0005" cut and grind $\frac{1}{3}$ of the way across the width of the workpiece. Stop the machine, zero the downfeed, raise the wheel and move the table to take a cut across the opposite $\frac{1}{3}$ of the surface. Set the downfeed to .0005" and make the second cut.

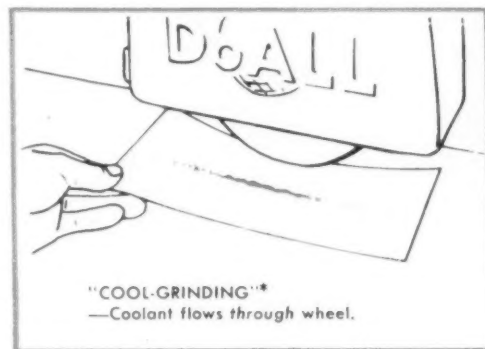
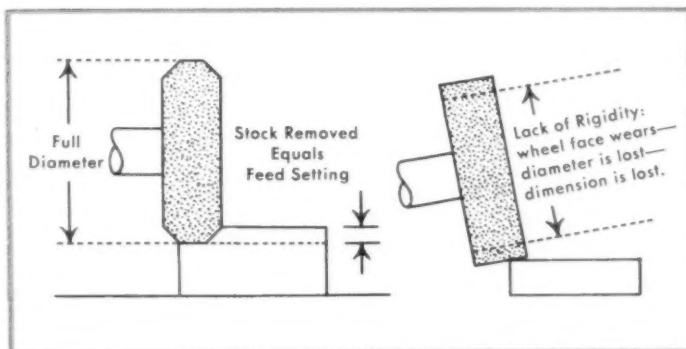
Remove the piece and check three points on each surface. All six points will check out perfectly at .0005" depth!

See this demonstration at your own plant, without obligation. Call your local DoALL Store or write to The DoALL Company, Des Plaines, Ill.

IS DUPLICATED HERE!



HOW DoALL CONTROLS GRINDER ACCURACY



1. Control of Wheel Diameter. This requires *rigidity* and *smooth, powerful table travel*. On a DoALL Grinder the leading edge of the wheel takes the brunt of the cutting. The wheel face and diameter remain true, assuring dimensional accuracy of work—see diagram above.

DoALL design eliminates table “gallop” which rapidly breaks down wheels. Even on the slow speeds of crush form grinding, travel is smooth and uniform because of an attachment which meters fluid from the hydraulic table drive cylinder.

Rapid cross-indexing during table reversal prevents damage to wheel resulting from contacting work during cross movement.

2. Control of Wheel-to-Table Dimension. The rigidity of DoALL Grinders prevents error-producing “give” and table deflection.

Distance from table to wheel remains constant even during heavy cuts.

3. Control of Thermal Expansion. Overheating of the workpiece creates expansion that results in inaccuracy when the work cools. The optional DoALL “Cool-Grinding” and Flood Coolant Attachment provides greater and more uniform cooling than any other method. In “Cool-Grinding” coolant enters the wheel near the center through pick-up rings, flows through the pores and out in a fine mist, providing evaporative cooling at the point of cut where heat is generated. On heavy, sustained cutting, the flood cooling is used to assure uniform heat regulation of the entire workpiece.

Certified Size, Finish, Flatness, Parallelism—see next page.....



Automatic Mass Production of Precision Surfaces

Complete reliance upon handwheel settings permits production line automatic grinding without constant checking of work in the DoALL grinders.

Get the Facts About Faster, More Accurate Lower Cost Surface Grinding . . .

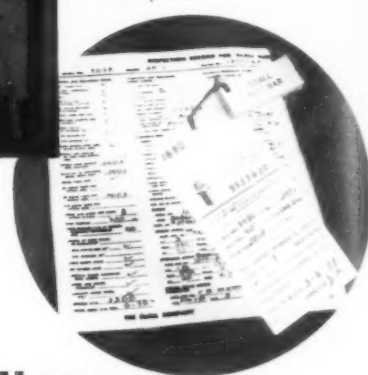


Field Demonstration.

DoAll will bring a grinder to your plant and demonstrate it in "your own backyard". You can see it and believe it—a totally new standard of surface grinder accuracy, performance, speed and economy.

Certified Finish, Flatness, Parallelism and Accuracy.

Every DoALL Grinder must pass critical operating tests before shipment. The machine is certified to produce a 10 micro-inch R.M.S., or better surface finish. A test block on which this has been done is shipped with the grinder. A complete inspection report accompanies each grinder attesting to the performance of every component.



LITERATURE — Ask for the new DoALL Grinder Catalog describing the design and construction of the complete line of seven models from 6" x 18" to 10" x 30".

FILMS — color, sound movies showing how you can produce more with DoALL Grinders are available for group showings. Call your local DoALL Store or write DoALL, Des Plaines, Ill.

Challenge DoALL!

— ASK FOR A DEMONSTRATION

Call DoALL for a free demonstration at your plant. Make the operator prove DoALL performance before your own eyes. You be the judge—compare DoALL performance with that of any other grinder in your plant! Call your local DoALL Store today or write. There is no obligation.

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FLAT HEAD
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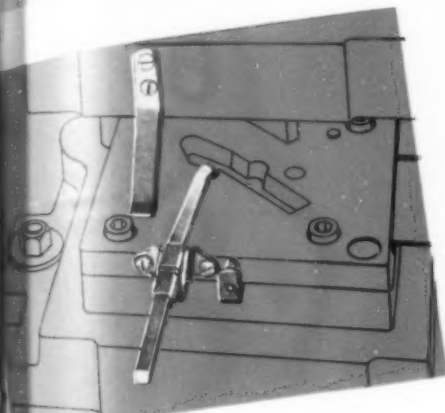
GUIDE
POSTS



BUSHINGS

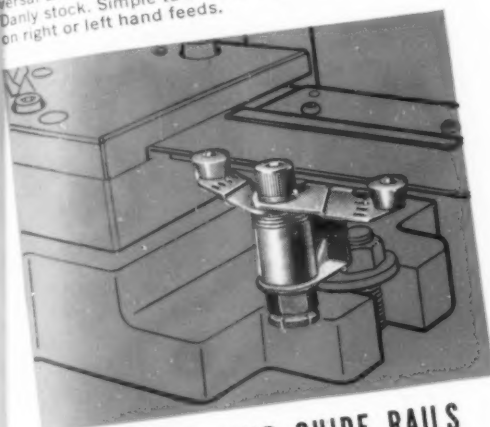


TOGGLE
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Low cost, rugged, easy to install, this new addition to the Danly line is used on dies or in any operation where coil and strip stock must be guided. Hardened parts assure long wear. Packaged complete with mounting screws and dowels.

*...look over
this broad line and
see why
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is your best source
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supplies*

Danly's original and most complete line of diemakers' supplies has now been expanded to include the new items being called for by the tool, gage, and die making industry. All items in the line are manufactured to close tolerances and exacting performance standards in sizes to meet your needs... all are quickly available from stock at your Danly branch, or through leading industrial distributors everywhere. For complete fast service, for dependable parts, call Danly.

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...puts it on a holder that
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Eliminate integral tapered shanks and cumbersome tool changing on heavy end mill jobs with the new, proven Postiv-Lok end mills. They'll cut your end mill costs up to 25%, give smooth, chatter-free cutting through torque-aided locking. Write for catalog on your letterhead.

Postiv-Lok adapters
simplify change-over to
small end mills, shell
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Modern MC Collapsible Tap

Stationary and Rotary, and in five sizes ranging from $1\frac{5}{16}$ " to $3\frac{1}{2}$ ", these New MC Taps have more new features—money saving features—than we can tell you about in this ad.

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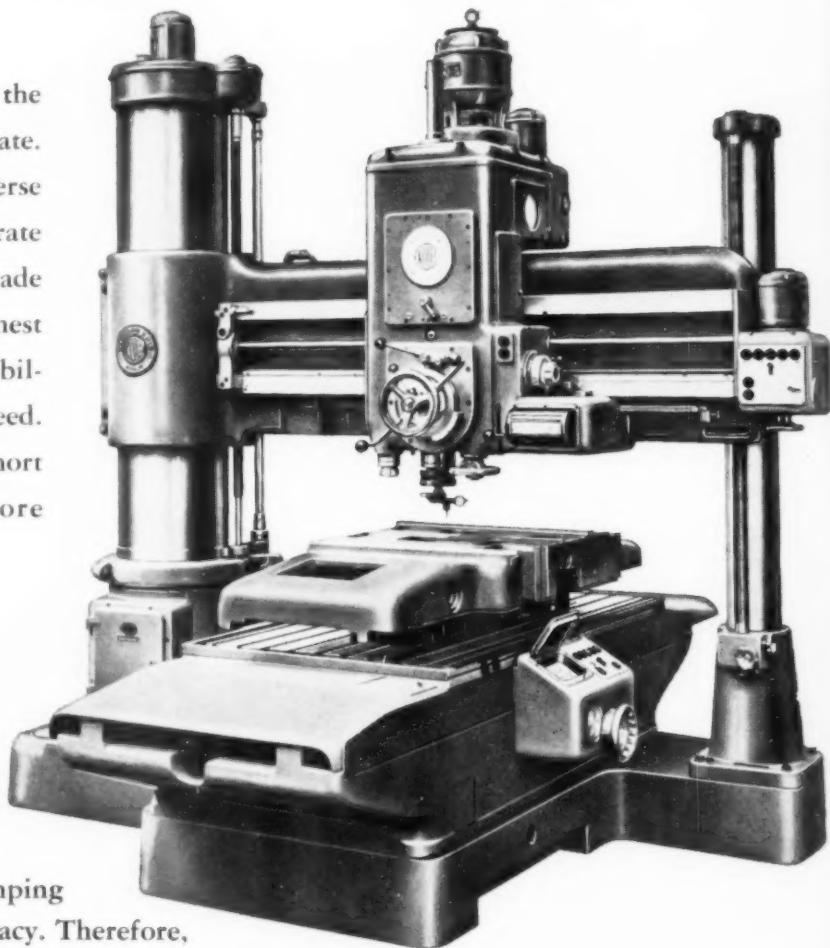
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YOU CAN POSITION A WORKPIECE
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Positioning a workpiece on the Kolb jig borer is fast and accurate. It's fast because of rapid traverse with adjustable stops—it's accurate because the optical system is made by Leitz, one of Germany's finest optical manufacturers. Repeatability of the coordinates is guaranteed. By eliminating costly jigs, short run jobs can be handled more profitably.



- Shock and distortion-free electro-hydraulic clamping does not impair accuracy. Therefore, reading accuracy equals positioning accuracy. Signal lights indicate if head and table are clamped or unclamped,
- Convenient pushbutton control—preselection of 18 feeds and 36 speeds.
- An excellent machine for drilling, boring, reaming, tapping and milling as well as precision measuring.
- Optical system has a magnification of 1:100—five inches on the focusing screen is equivalent to a movement of 0.05 inches along the coordinate.
- Working surface of table 69x39", clearance between columns 73", maximum distance between spindle and table 40".

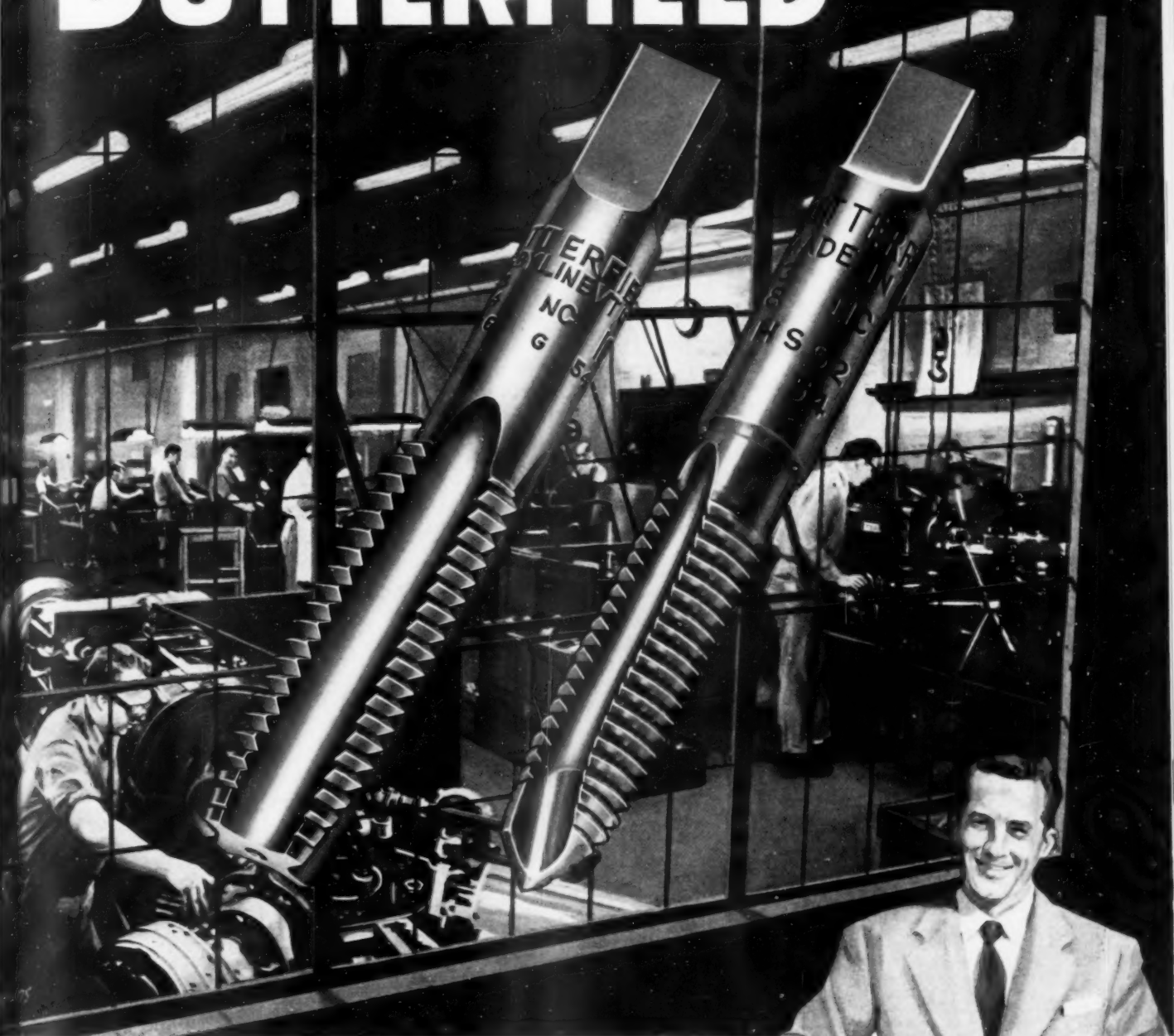
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—from bench lathes to boring mills.

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A COMPLETE LINE OF QUALITY cutting tools is now available from your Butterfield distributor. Taps are made to the same exacting standards as Butterfield Milling Cutters, Dies, Drills, Reamers, Counterbores and End mills.

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BUTTERFIELD DIVISION
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APEX INSERTED-BLADE METAL-CUTTING TOOLS

APEX MILLING CUTTERS

Made with inserted blades, all drop-forged of selected steels.

Adjustable for diameter or width.

Single or multiple operations with blades of High Speed, Super Cobalt, Stellite, Rexalloy, or Carbide Tipped. Standard sizes, including large diameters, carried in stock.



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Adjustable serrated for maximum wear. Over 50 standard shapes of tool bits interchange in one holder. Angle tools for Plate Planers carried in stock. Special shapes to order.

Tools drop-forged of High Speed Steel, Super Cobalt Steel, or tipped tools of Stellite, Rexalloy, or any grade or make of Carbide. Furnished ground ready for use.

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BUILT FOR SPECIFIC PRODUCTION JOBS



- Single or Multiple Head Operation
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 - Fast, Accurate Rugged Index
 - Other Head Units Available
 - And Many Other, Worthwhile Features

Send prints and sample of your work for further information and recommendations on how Kaufman Tapping Machines can reduce your production costs.

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BECAUSE THEY DO NOT EXIST!

When you engineer two and a half men off the production line (and more important, off the payroll) you are making real headway in getting your product cost down, no matter what you manufacture.

PEECO CUTS SMALL PARTS FEEDING PAYROLL 2½ TO 1



Peeco engineering helps you right in the payroll. They not only build better small parts feeders—they custom engineer the bowl to the part—and the 'payoff' is they work. Let Peeco help cut your production costs. Send for "Operation-Automation" today.

Small parts feeding is PEECO'S business—not a side line.



PERRY EQUIPMENT & ENGINEERING CO.

3125 BRANDES ST., ERIE, PA.

USE READER SERVICE CARD; INDICATE A-9-326-3

The Tool Engineer

Tube Makers Please Note —

A tube mill represents a major investment. Good business practice dictates that before you invest—you should investigate.

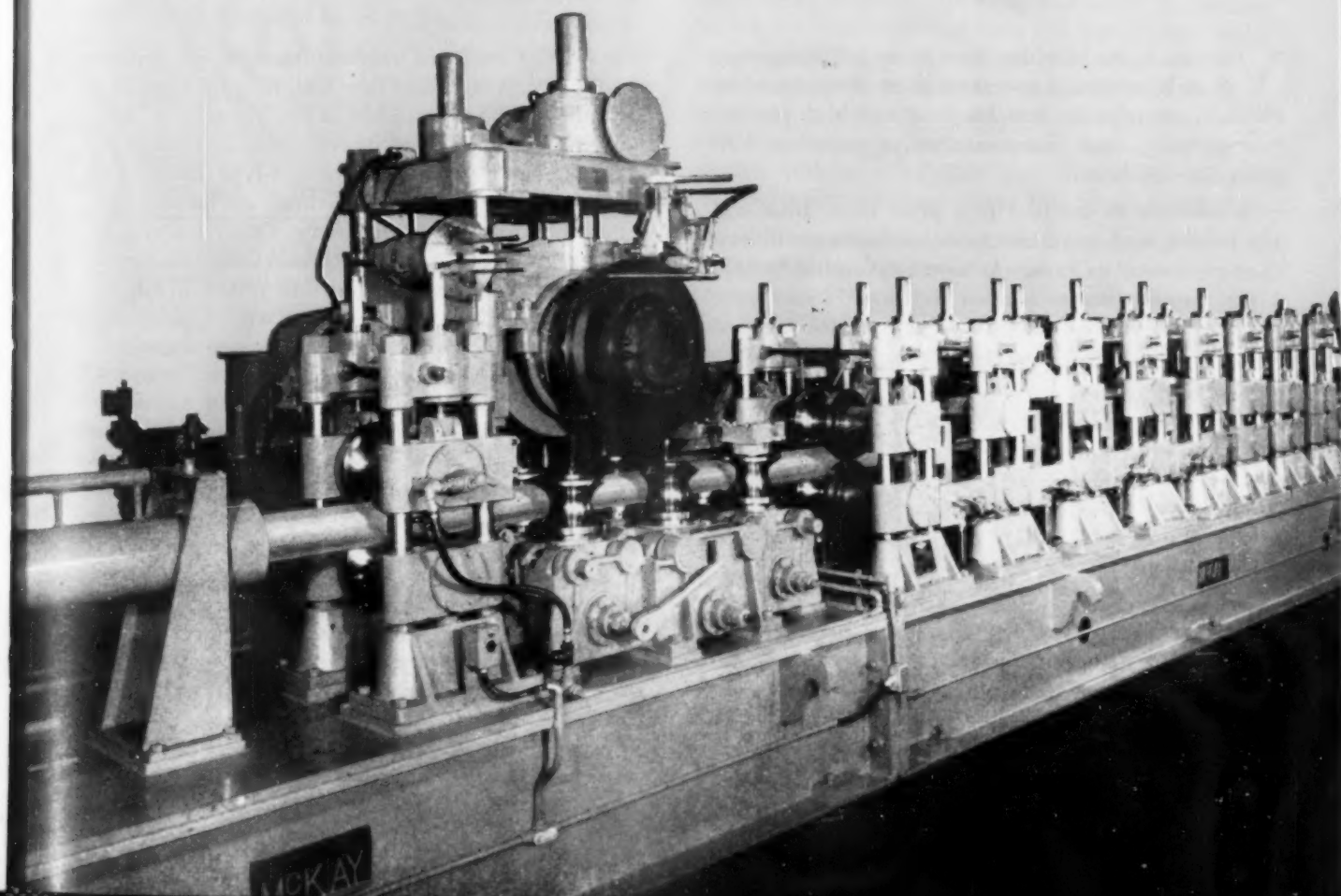
We here at McKay believe we build the finest tube mill made today. We could point to many features that support this belief. However, these features are all a part of our determination to constantly improve the product, and to *never substitute for quality.*

Experience has proved the most expensive single item in tube mill operation is *down time*. This time lost can quickly mount into thousands of dollars — making any savings in the initial cost of equipment trivial by comparison.

Every McKay Tube Mill is designed to deliver the ultimate in **PERFORMANCE, PRECISION, RUGGEDNESS** and **SAFETY**. Compare! Investigate thoroughly before you buy and we feel sure you'll specify **TUBE MILLS** by McKay.

THE MCKAY MACHINE COMPANY, Youngstown, Ohio

Designers and builders of modern tube making, forming, sizing, reducing, welding and cut-off equipment.



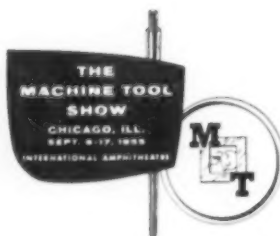


Exhibit No. 1414

Bliss unveils four new lines of metal working presses

Many innovations in auxiliary equipment to be revealed for the first time

VISITORS to the Machine Tool Show in Chicago will be able to witness operation of newly-designed inclinable, straightside, knuckle joint and high production presses — each representative of complete new press lines by Bliss.

In addition to the four new press lines, Bliss will also exhibit such important new developments in auxiliary equipment as its new Automation Control Switch, a new combination air friction clutch and brake, new feed mechanisms, and a host of other up-to-the-moment designs.

What promises to be an outstanding attraction of the Bliss exhibit, however, will be its premiere showing of four new color and sound movies on the subjects of press maintenance, automotive and appliance industry uses of Bliss-designed transfer feed presses, and on the Bliss-Crary Tonnage Limitor — a new and unusual "overload" device.

For those who intend to visit the Show, the contents of the Bliss exhibit are briefly described here with the hope that it will help them decide what they would particularly like to see, and thus help them make the most of their limited time. For those unable to attend, full particulars on all described here are available on request.

New line of enclosed inclinables with air friction clutches . . . A complete new line, ranging from 75 to 200 tons, will be represented at the Show by a 75-ton model. These are extra-heavy presses: frames are totally-enclosed and they have box-type crowns. All electrical, air and lubrication controls are housed within flush-fitted panels in the frame. Other features include: air friction clutches, motorized slide adjustments and inclining mechanisms, automatic return oil lubrication, bronze liners in the slide, heavy wrist-type connections, and extra-long gibbing. All die space dimensions and controls conform to JIC standards.

Streamlined, enclosed coining press has new wedge-type adjustment . . . Bliss' new line of coining presses will be represented at the Show by a 400-ton model which will be set up to strike souvenir Bliss medallions. Most outstanding feature of the press is its new motorized wedge-type adjustment which eliminates the need for a separate top lock device and compression springs. The new press is streamlined in appearance, and its controls are neatly housed in semi-flush panels. Two independent lubrication systems are now utilized in Bliss coining presses — one to circulate cascade type lubrication to the knuckles and the other for remainder of the press bearings.

new ideas highlighted in —

PREMIERE SHOWING OF FOUR MOVIES FOR PRESS USERS

These movies will be run in the Bliss exhibit on an around-the-clock basis. A movie "time-clock" will tell you when the one you want to see will begin. After the Show, all movies will be available upon request for showing to your own personnel.

Power Press Maintenance . . . The picture was developed for instruction of personnel responsible for the upkeep of presses. It shows correct procedures for set-up of new Bliss straightside and inclinable presses . . . describes proper lubrication, inspection and maintenance methods; tells how to check and adjust slide alignment, how to adjust ball joints . . . bearing clearances . . . clutches . . . and also describes free counsel available through Bliss' new Preventive Maintenance Program.

Bliss' 1000th transfer feed press . . . Viewers see how this 250-ton transfer feed press performs 11 separate operations on 5" steel blanks and produces finished auto starter brush end plates — all automatically. The dial feed, the dies required in each of the 11 stations, and the electrical interlocks that protect the press

against misfeeds are all carefully explained.

Transfer feed presses in the appliance industry . . . Shows how a large appliance manufacturer uses a 700-ton Bliss transfer feed press to turn out refrigerator shelves and crisper pans from coil stock. Shows every step from the coil through the series of dies to the finished pans. The transfer feed mechanism alone makes it well worth the watching.

The Bliss-Crary tonnage Limitor . . . This movie explains a new device designed to protect presses from overloads at every point of the stroke. It reveals that, unlike earlier devices, the Limitor adjusts itself automatically to changing press capacity characteristics at different parts of the press cycle. How it's done is explained in the film in detail.

High production press has new feed, new lube system . . . A new Bliss 60-ton H-P press, capable of making more than 450 stampings per minute, represents the new line at the Show. The feeds have been redesigned and now incorporate a new rack and pinion feed drive, an anti-friction overrunning feed clutch, and a newly-designed scrap shear. Another change has been in the press legs. In its left leg have been housed its air controls, and in the right is the "heart" of a completely new return oil lubrication system — a large oil reservoir, filters and pump. Controls have been removed from the press and mounted instead on a pedestal base.

"Packaged" straightside presses: controls, piping and wiring part of the package . . . The 250-ton straightside two-point press exhibited at the show, "baby" of the line, is typical of six new lines of "packaged" presses designed by E. W. Bliss Company to aid the stamping industry in its swing towards automated production. Presses in the line, two of which are "under-drives", embody JIC specifications; are shipped

ready to be installed. About all that needs to be done is plug in air and electrical lines. Putting all pipes, wires and controls in uprights leaves clean, uncluttered exterior, and speeds maintenance. Other features include automatic recirculating oil systems, motorized plunger and blankholder adjustments, and high speed air or electric clutches—and Bliss' new Automation Control Switch for dozer, kickers, lifters, Iron Hands and the like.

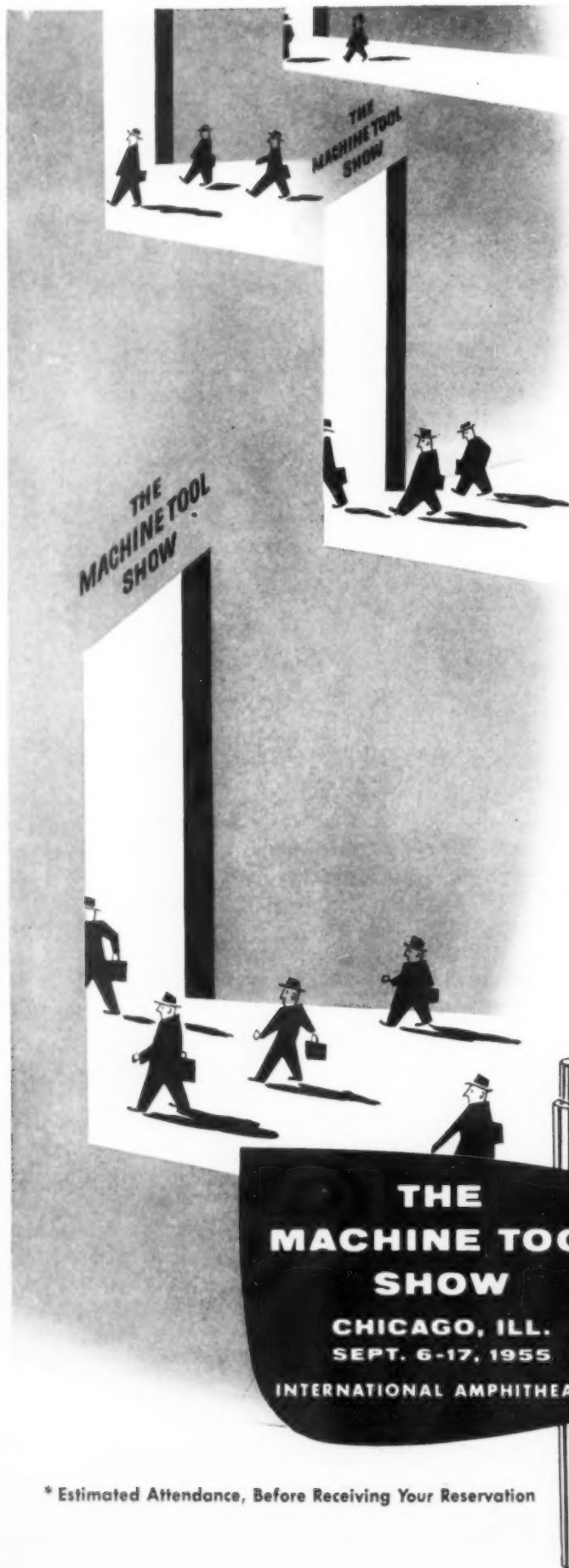
In addition . . . Bliss will take the wraps off its new Automation Switch, a new electro-mechanical nine-station rotary limit switch whose major advantage is the fact that despite its simplicity of adjustment and operation, it is accurate within less than *one degree*.

Also shown will be the details of Bliss' new crankshaft mounted combination air friction clutch and brake . . . new developments in die sets and die springs . . . new feeds and feed components . . . and a host of other developments, many of which may be of immediate and pressing interest to you. You're cordially invited to drop by the Bliss Exhibit, No. 1414, and see the latest developments in the pressed metal industry.



is more than a name... it's a guarantee!

E. W. BLISS COMPANY, Canton, Ohio
PRESSES, ROLLING MILLS, SPECIAL MACHINERY



17,032*

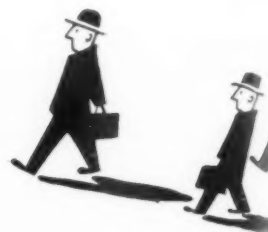
General Managers looking for **BETTER METHODS!**

Plan *now* to join them—at the Machine Tool Show. You'll find a wealth of answers to each of your metalworking problems. More than ninety per cent of the country's leading machine tool builders will be on hand, ready to show you their newest models, their fastest, most ingenious, most economical production methods.

It's the largest and most important show of its kind; one you can't afford to miss. The last time it was held, in 1947, all attendance records were broken—and this time even greater crowds are expected. The Production Engineering Show, being held on the Navy Pier, in Chicago, on the same dates, offers a bonus attraction that's hard to beat; a chance to see the latest in machine tool accessories at no additional cost. The same badge will admit you to both shows.

Bring your key production people to Chicago in September; share with them this unequalled opportunity to see the latest developments in machine tools. The 1955 Machine Tool Show is the best chance you've ever had to see the world's best investment—in action!

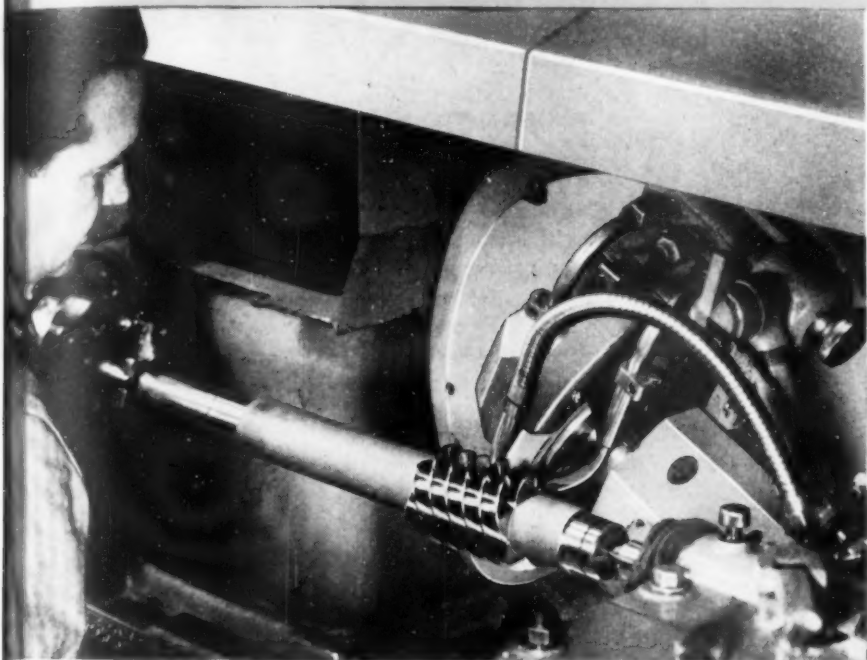
NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION
2071 East 102 Street • Cleveland 6, Ohio



* Estimated Attendance, Before Receiving Your Reservation

Grinding 5-Start Worm with 4" Lead

STANDARD STYLE 36 EX-CELL-O Precision THREAD GRINDER



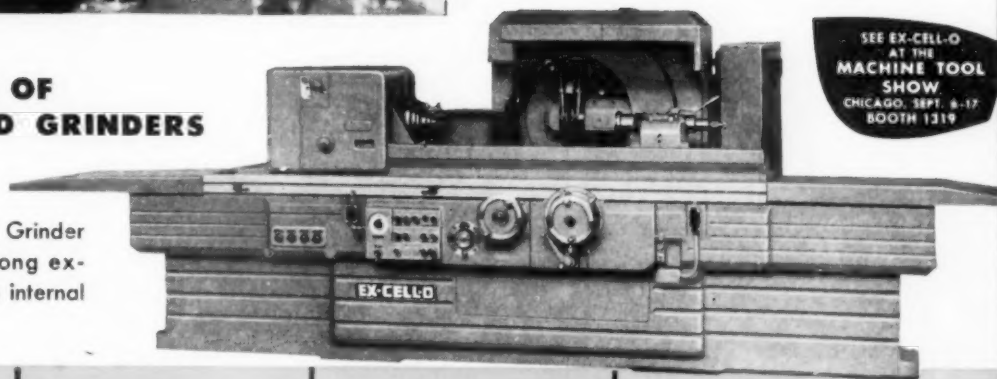
In the photograph at the left the operator is grinding a worm shaft for use in a special machine. The part is about 22" long and the worm is 4½" long, 3.430" O.D., has 5 starts, a pitch of .800", a lead of 4" and a tooth depth of .5454". The worm was ground in two operations on a standard Style 36 Thread Grinder. It was rough ground from the solid, hardened, then finish ground.

For complete information and specifications on the Style 36 and other Ex-Cell-O Thread Grinders contact your local representative or write today to Ex-Cell-O.



A COMPLETE LINE OF PRECISION THREAD GRINDERS

STYLE 36 Precision Thread Grinder—a versatile machine for long external threads, available with internal attachment.



SEE EX-CELL-O
AT THE
MACHINE TOOL
SHOW
CHICAGO, SEPT. 8-17
BOOTH 1319

STYLE 50
Precision Thread Grinder—a versatile machine for external work, also available with internal attachment.

STYLE 33
Precision Thread Grinder—a high production machine for external work.

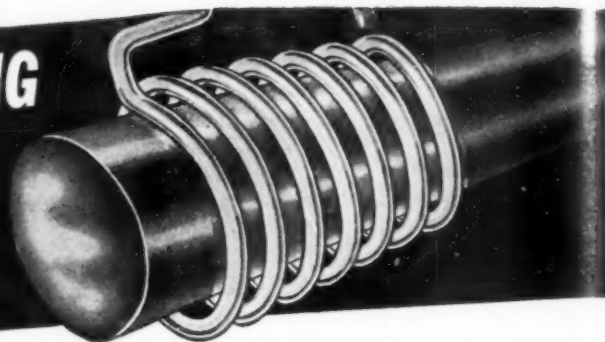
STYLE 39-A
Precision Thread Grinder—a high production machine for internal threads.

STYLE 120
Our largest Thread Grinder. Grinds 10 feet of thread in one setting. Accommodates 12 feet of stock between centers.

EX-CELL-O CORPORATION • Detroit 32, Michigan

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

YOU CAN HEAT ANYTHING
FROM A NEEDLE . . . TO
A TURBINE SHAFT
FASTER and BETTER



BRAZING

Permits widest choice of silver or copper brazing alloys from lowest to highest melting points. Ideal for brazing carbide tips.

HARDENING

Heat localized exactly where wanted at desired temperature. Ideal for gears, cams, bearing surfaces, cutting tools and other areas that are subject to wear.

SOLDERING

Speedily and neatly performs intricate soldering applications with or without the use of preformed rings.

ANNEALING

Ideal for annealing, stress-relieving, normalizing or pre-heating selected areas.

MELTING

Readily melts quantities of ferrous and non-ferrous metals in either graphite or ceramic crucibles.



2 1/2 KW INDUCTION HEATING UNIT



30 KW INDUCTION HEATING UNIT

LEPEL Electronic Tube GENERATORS
1 KW; 2 1/2 KW; 5 KW; 10 KW; 20 KW;
30 KW; 50 KW; 75 KW; 100 KW.

LEPEL Spark Gap Converters
2 KW; 4 KW; 7 1/2 KW; 15 KW; 30 KW.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

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HIGH FREQUENCY *Induction* HEATING UNITS

The Lepel line of induction heating units represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating. With a background of half a century of electrical and metallurgical experience, the name Lepel has become the symbol for quality in induction heating equipment embodying the highest standards of engineering achievement, dependable low cost operation and safety.

If you are interested in the application of induction heating you are invited to send samples of the work with specifications of the operations to be performed. Our engineers will process these samples and return the completed job with full data and recommendations without any cost or obligation.



100 KW INDUCTION HEATING UNIT

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information on high frequency induction heating.



LEPEL HIGH FREQUENCY LABORATORIES, INC.
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Syracuse Small Tool and Gauge Co., Inc.

Syracuse, New York

Proved this about... Olympic FM DIE STEEL

YOU, too, can cut die production costs! Specify Olympic FM High Carbon-High Chromium die steel... one of Latrobe's new die steels with improved machinability made possible through the addition of alloy sulphides uniformly dispersed by the DESEGATIZED® process of manufacture. Over 250 sizes regularly stocked at 10 convenient warehouse locations.



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TOOL AND
DIEMAKERS

SYRACUSE 1, NEW YORK

Gentlemen:

We wish to take this opportunity to advise that we have found your Olympic FM steel superior to any other hi-carbon, hi-chrome die steel that we have used.

To prove to ourselves that we were getting the results that were showing up in our cost records, we have run a simple comparison test and found as follows:

OLYMPIC FM	STEEL "C"	STEEL "B"
SHAPER:- .200" CUT @ .010" FEED.		
Free, easy stock removal, light chip.	Rough stock removal, dark chip, short tool life.	Rough stock removal, and short tool life.
MILLING:- .250" CUT WITH 1/2" ENDMILL; FEED, 7/8"; SPEED, 270 RPM.		
Free, easy stock removal, good finish bright chip.	Rough out, poor finish dark chip, short tool life.	Easier stock removal than "C" but not as free as OLYMPIC FM, dark chip, short tool life.
DRILLING:- 5/8" DRILL, HAND FEED.		
Average drill pressure required, bright chip.	Maximum pressure required, slower feed, dark chip, very short tool life.	More pressure needed than for OLYMPIC FM, straw colored chip, fair tool life.
FILING:- MACHINE & HAND.		
Free and rapid stock removal, good tool life	Stock seems to glaze, slow stock removal and, short tool life.	Slow stock removal, short tool life.

In addition to the results as listed above, in the overall experience of all stock removal operations such as turning, boring, tapping, grinding, etc., we have found that Olympic FM produces a good job easier than other comparable die steels.

As far as our organization is concerned, the proof of our total experience is in the fact that our diemakers request Olympic FM as do many of our customers.

Congratulations on producing a superior product.

Very truly yours,

SYRACUSE SMALL TOOL & GUAGE CO., INC.

C. E. McCabe
C. E. McCabe
PRESIDENT

CEM/m

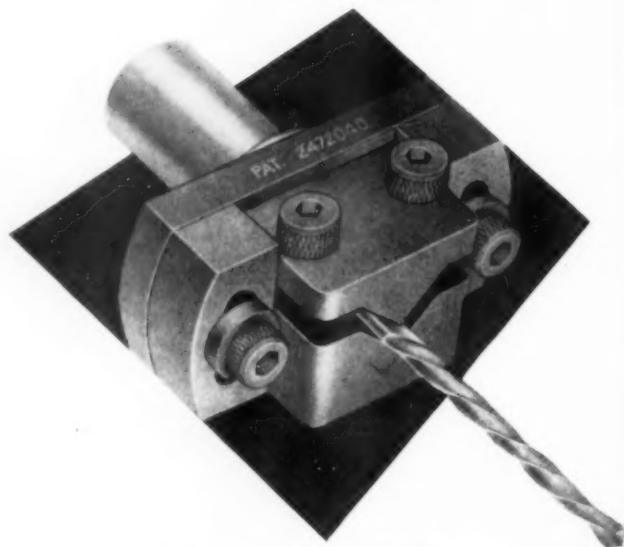
LATROBE STEEL COMPANY

MAIN OFFICE AND PLANT • LATROBE, PENNSYLVANIA

Branch Offices and Warehouses in Principal Cities.

At Last

A tool holder that requires no bushings or collets



THE NEW PATENTED

Brookfield

Drills, counter-bores, reamers, cutters, in a wide range of diameters (Model GA-16, for example holds from 1/16" to 3/4" without bushings or collets) can now be accurately set up on the *first try* and held with absolute precision for almost every machining operation. Made of hardened chrome-nickel steel, stress-relieved, the Brookfield Tool Holder is an adjustable V-jaw vise, precision ground for perfect alignment.

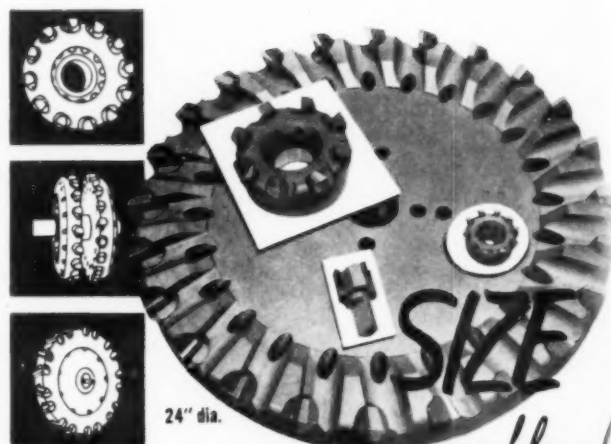
With just one wrench, perfect set-ups are assured every time. Just insert the tool, tighten the jaw, then float the tool into dead center position and tighten the balanced pressure locking screws. As simple as that!

Think of the savings the Brookfield Tool Holder means on bushing stock costs, on man hours, on reject work! Why delay? Today, write, wire, phone for complete, factual information. It is yours without obligation by return mail.

BROOKFIELD, INCORPORATED
STOUGHTON 16, MASSACHUSETTS

Patent No. 2,472,040

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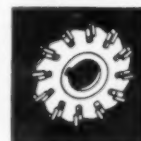
24" dia.

SIZE is no problem!

...what's more, Lovejoy is set to give good delivery. Lovejoy's large engineering staff and modern plant offer every facility for production of any size standard or special milling cutter. Our 35 years' experience can help you get the best results, economically, on all milling operations. And, no matter what the age of your Lovejoy housings, blades of H.S.S., alloy and carbide are promptly available from stock!



Free — 3 new Lovejoy catalogs: Arbors, Face Mills, Side Mills. Also the Lovejoy Speed and Feed Calculator. Write today!



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THE RECORD BREAKER..



Model M-CR-B

"JUNIOR" Does a Man's Size Job!

A smaller but husky model that can be used on many operations where a lighter weight tool is advantageous. Stays on the tough jobs day in and day out. 4 TYPES: 2 types of spindle extension; 2 types of air control valves; steel body; grease-sealed bearings; light weight, 12 ounces. Accommodates mounted grinding wheels, rotary files, etc. **SPEEDY**—Will operate Tungsten Carbide Burs, Rotary Files, etc. to their full efficiency.

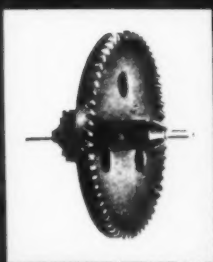
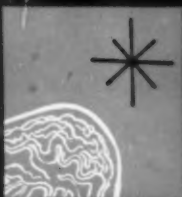
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The Tool Engineer



precision begins with the man...

to the Swiss, "precision" is not just a word, it is a way of life... the product of generations of dedicated craftsmanship.

Only these traditions could produce Tornos Swiss type automatics, Hauser jig borers, Schaublin toolmaker's lathes, and the other fine Swiss machine tools sold and serviced by Hirschmann.

When your job calls for high precision...call for Hirschmann.

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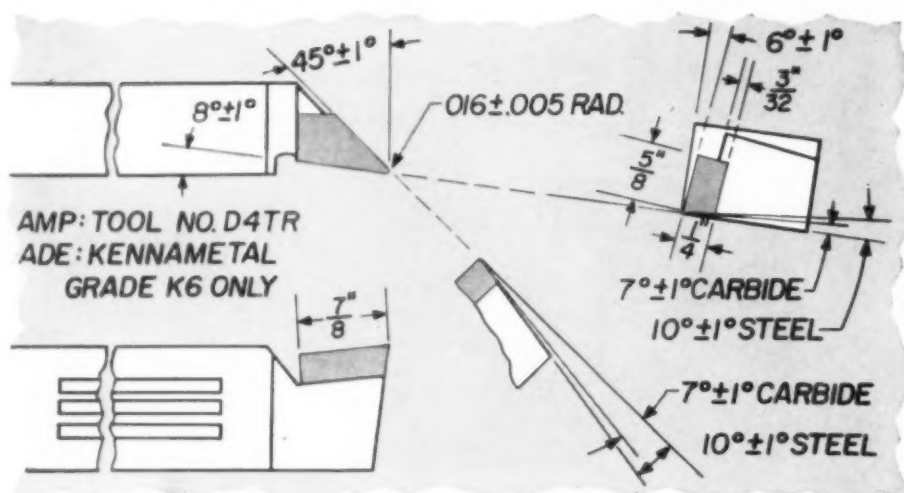
hirschmann CO., INC.

30 PARK AVENUE MANHASSET, N. Y.

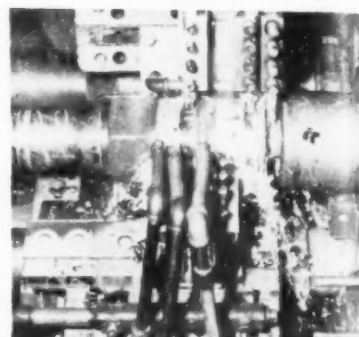
LOS ANGELES • MILWAUKEE • CHICAGO • DETROIT

largest selection of Swiss high-precision machine tools in America

IT PAYS TO BE SPECIFIC!



**PROVED BEST
TEST AFTER TEST**



Grade K2S—Rough turning SAE steel housing assemblies reduced from 45 to 18 minutes each.

PINPOINT THE RIGHT GRADE of carbide for each operation when you make up your prints

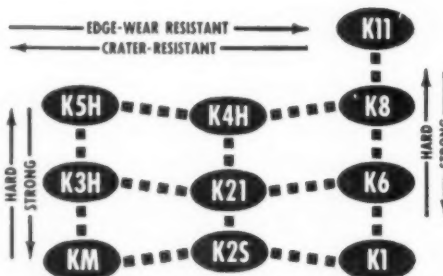
Consistent carbide performance is a must in keeping production lines moving and costs under control. Even brief shutdowns, or shortages along the line due to tool trouble, can send costs zooming . . . at station after station . . . until the added costs far exceed that of the best carbide available. So it pays to get the best.

How do you get the best?

The only way, of course, is to specify the grade found best for each operation—the grade that does the best job by providing:

1. The most pieces per grind
2. The longest life per tool or per insert
3. The most consistent *repeat* performance—regrind after regrind or insert after insert.

When you specify Kennametal* tooling, you can depend on top performance . . . consistently . . . from the first run, through each regrind, tool after tool. It helps you forecast performance with assurance because every Kennametal grade has high *reserve* strength . . . the strength needed to stand up to wide variations in materials and machines.

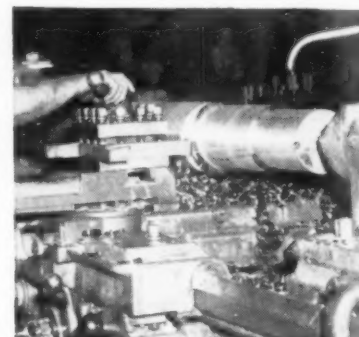


Kennametal helps keep production flowing.

To be sure of the best performance, specify Kennametal. But be specific . . . specify by grade. Once you have the grade pegged for a job, show it on the print . . . added protection that will help you realize dividends through increased production.

A Kennametal Tool Engineer will help you select the *right* grade of Kennametal for each operation. He works exclusively with Kennametal . . . applying and servicing it. His specialized experience could be of great value to you. KENNAMETAL INC., Latrobe, Pa.

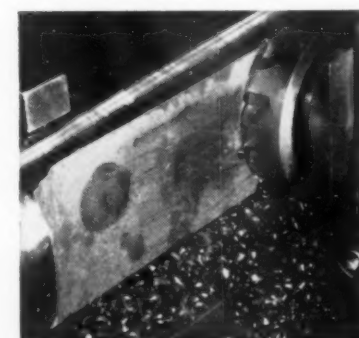
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Grade K2S—Floor to floor time reduced 34% for machining ends of steel drive shafts, requiring 9 passes.



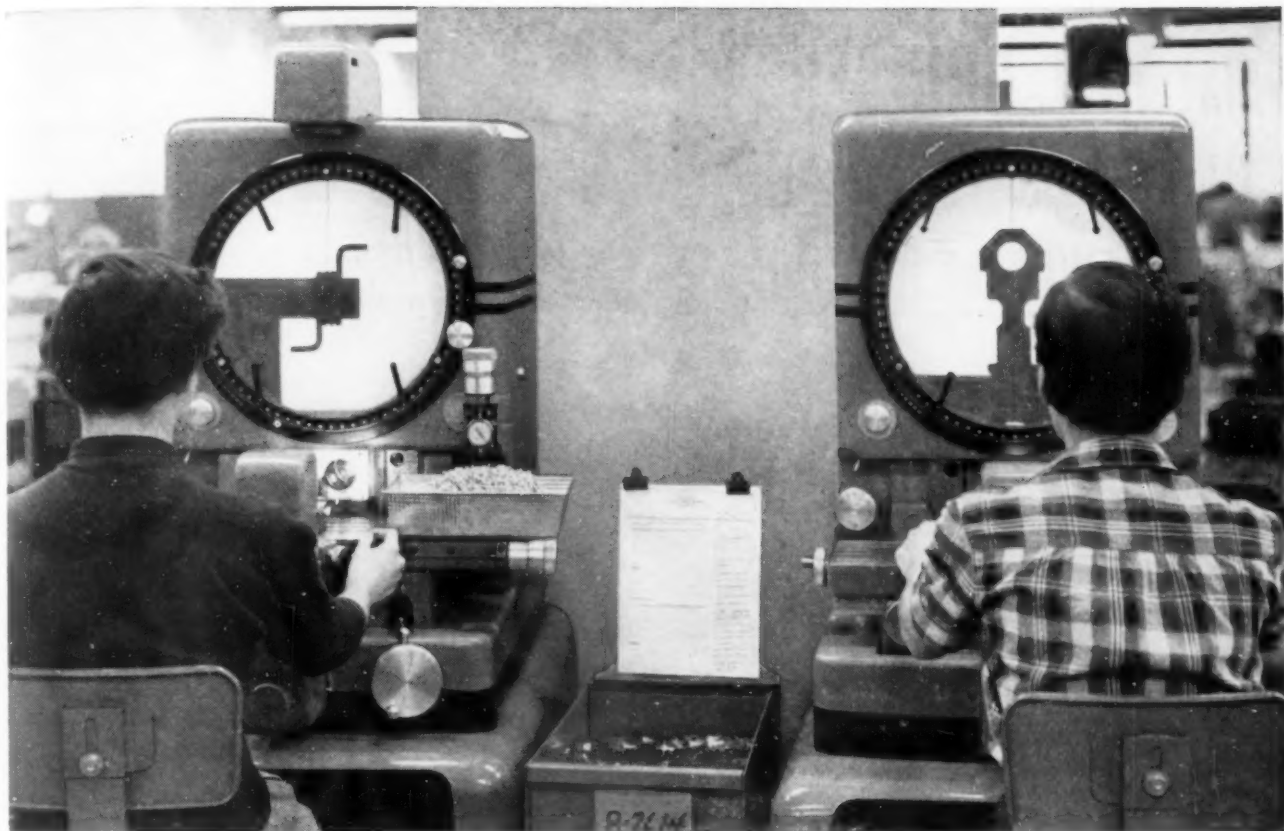
Grade 3H—Kennametal tooling reduces machining time 60% on chrome-nickel-moly bar stock.



Grade K2S—10 times longer cutting life, with 8 times faster speed and feed with Kennamill* milling.



INDUSTRY AND
KENNAMETAL
... Partners in Progress



Girls at the Allen-Bradley Company, leading makers of electrical equipment, use Kodak Contour Projectors to inspect incoming precision parts quickly and accurately.

To speed parts from receiving dock to production . . .

Allen-Bradley uses Kodak Contour Projectors

Receiving inspection can be a bottleneck, slowing the production operation when, on an average day, many separate shipments of component parts crowd the receiving room.

To avoid such a bottleneck and keep production lines moving, the Allen-Bradley Company combines statistical sampling methods with modern gaging equipment. Kodak Contour Projectors are used to check more than 400 different items, most having multiple dimensions and sample sizes of 35 or more pieces. Tolerances are held as close as .001".

Because optical gaging affords a check of several dimensions simultaneously, Allen-Bradley has cut inspection time dramatically: a typical part, requiring

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The result: No unnecessary delays—parts are quickly cleared for production. And quality control has improved.

You'll find that Kodak Contour Projectors are profitable wherever you need fast, accurate, complete inspection or measurement of almost any sort of part—simple or complex, large or small. And there are models to fit every need from the large Model 30 to the bench Model 8. To learn more about optical gaging and how it can help solve your problems, send for our illustrated booklet, "Kodak Contour Projectors." Use the coupon below.

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CONTOUR
PROJECTOR**

EASTMAN KODAK COMPANY

Special Products Sales Division, Rochester 4, N. Y.

- ☐ Please send me a copy of your booklet, "Kodak Contour Projectors."
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COMPANY _____

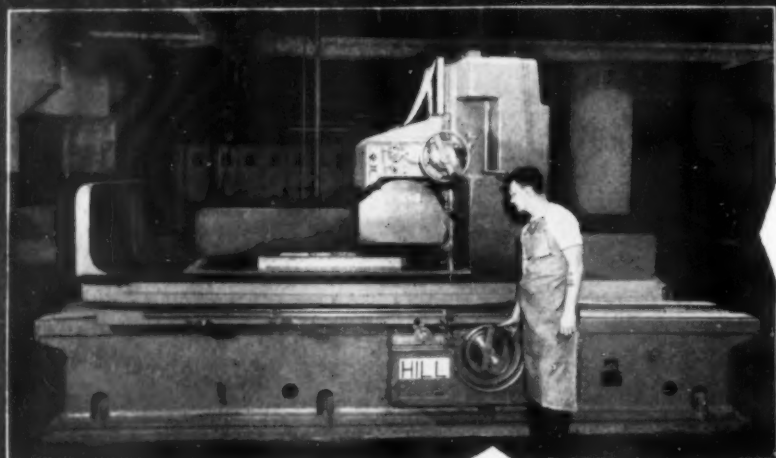
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 TRADE-MARK

What HILL GRINDERS Have Done for Others They Will Do for YOU!

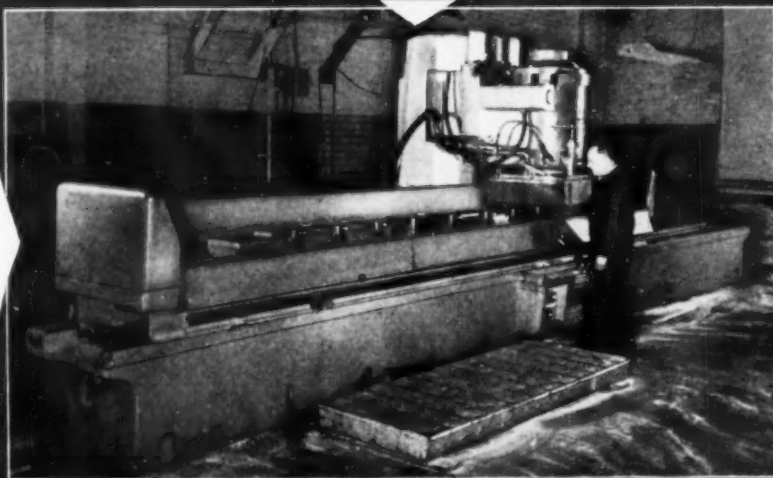
- Produce a smoother finish and closer tolerances.
- Increases man-hour production.
- Actual case histories prove definite worthwhile dollar savings over other methods



Use the "Hill" Horizontal Spindle Grinder for a wide range of grinding — flats, angles, irregular and special shaped surfaces — ideal for maintaining close tolerances with low micro inch finish. Made in table widths of 18", 24", 30" and 36" — table lengths from 5 to 20 feet.

- Built in both Horizontal Spindle and Vertical Spindle types.
- Choose the most efficient type for YOUR requirements.

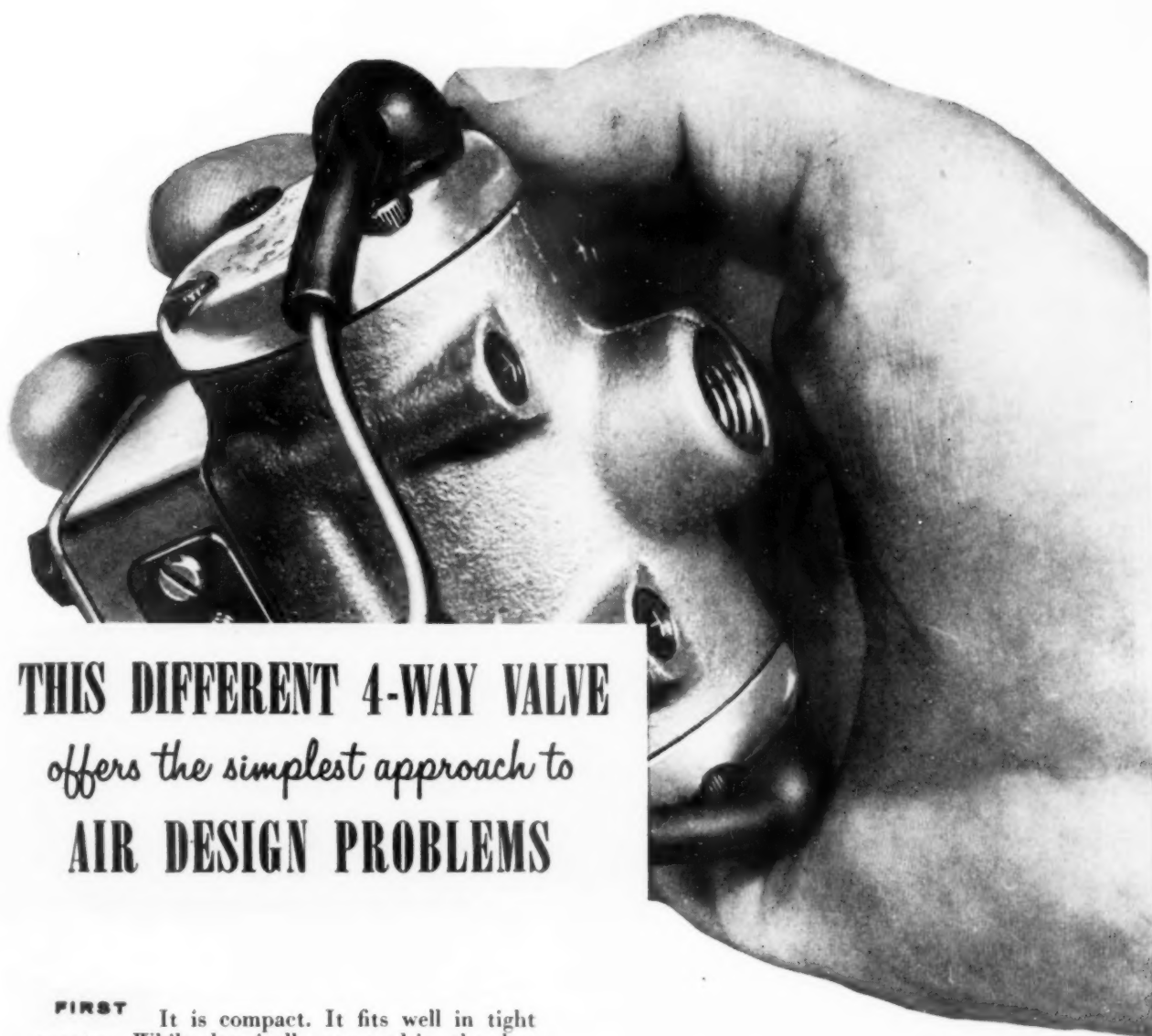
Use the "Hill" Vertical Spindle Grinder for rapid stock removal and accurate grinding of flat surfaces — recommended for accuracy, speed and finish — features that mean increased precision production. Made in table widths of 18", 24" and 30" — table lengths from 5 to 20 feet.



THE HILL ACME COMPANY

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"HILL" GRINDING & POLISHING MACHINES • HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING TAPPING MACHINES • "CANTON" ALLIGATOR SHEARS • BILLET SHEARS • PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES • SHEAR BLADES



THIS DIFFERENT 4-WAY VALVE

offers the simplest approach to

AIR DESIGN PROBLEMS

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It is compact. It fits well in tight quarters. While electrically actuated it takes but a fraction of the space required by double acting power solenoids. Yet it is a complete valve within itself, with built-in dual speed controls as well as directional valve control.

SECOND

It is safe—safe for operator, safe for machine. Operating on low voltage (8 volts) it is free from electrical hazard, and electrical hook-ups can be made without conduit or heavy insulation.

THIRD

It is rugged and durable. Operating records of 30, 40, 50 million or more cycles without maintenance expense are quite common. In fact, we guarantee the solenoid controls against burnout.

FOURTH

It is fast. Faster than the speed of even present-day short stroke air cylinders.



The Bellows Electro-air Valve is made in $\frac{1}{4}$ ", $\frac{3}{8}$ " and $\frac{1}{2}$ " port sizes. It can be adapted for direct connection to, or remote control of any air cylinder. It is a

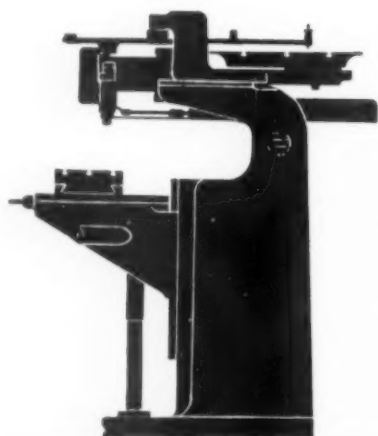
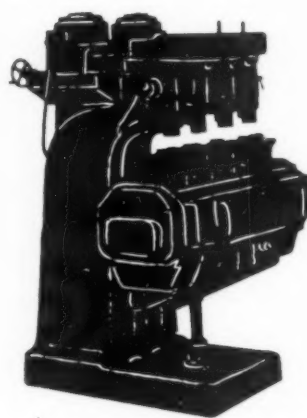
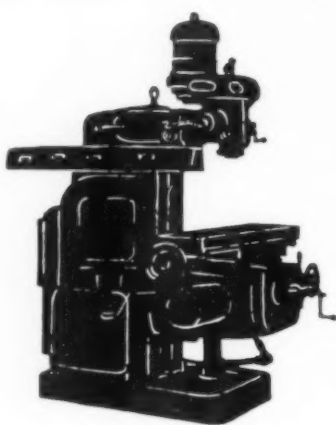
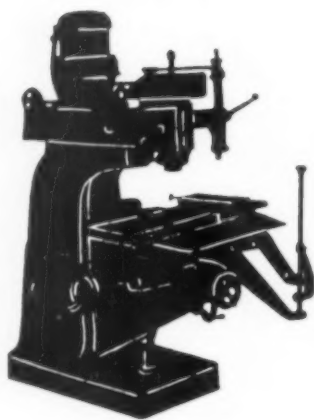
built-in feature of all Bellows Air Motors and "Controlled-Air-Power" Devices arranged for electrical control.

1221-A

Write for Bulletin AV-300R
Address: The Bellows Co., Akron 9, Ohio
In Canada: Bellows Pneumatic Devices of
Canada, Ltd., Toronto
Dept. TE955

The Bellows Co.
AKRON 9, OHIO

Shadows of Good Things to Come . . .



The "good things" are production speed-ups and cost cuts . . . yours with new Gorton machines. Come to Gorton's booth and see 17 machines operating under production load — many brand new and never before exhibited; some completely re-designed; others with typical Gorton improvements.

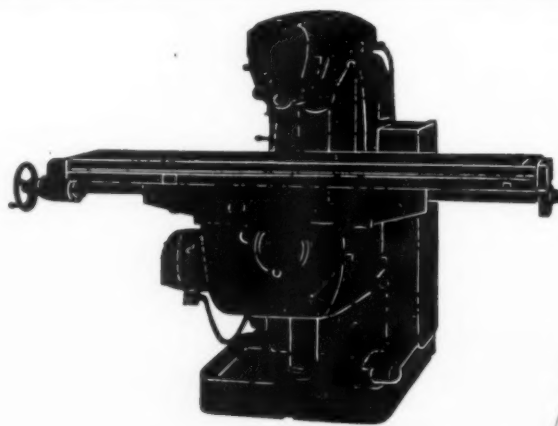
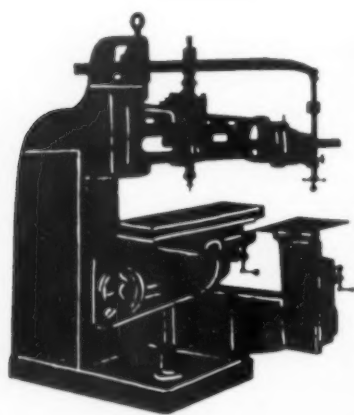
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Gorton No. 2 Horizontal with Receptor Ram and Super-Speed Universal head and ram assembly. Don't miss the *Economy Model* — No. 3 Horizontal with 76" table and 48" table travel.

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(Ground floor, south end of South Hall)

National Machine Tool Show, International Ampitheatre, Chicago Stock Yards, September 6 thru 17.



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Catalog 1655-2609



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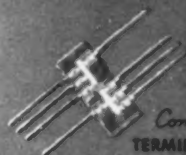
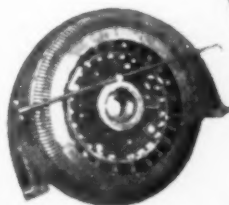
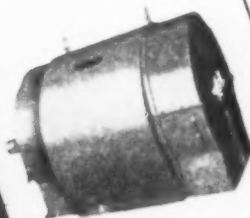


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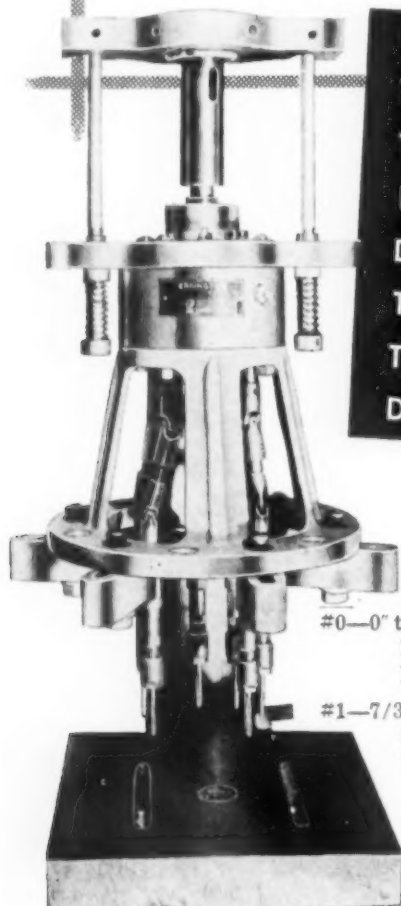
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UNIVERSAL JOINT ADJUSTABLE TAPPING & DRILLING HEAD

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LESS THAN
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TO CHANGE
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TAPPING OR
TAPPING TO
DRILLING

#0—0" to ¼" Tap Capacity
Min. centers 11/16"
Max. Pattern 5¼"

#1—7/32" to ½" Tap Capacity
Min. centers 1½"
Max. Pattern 8"

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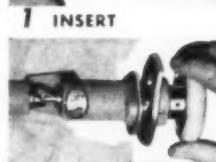
ERRINGTON Mechanical Laboratory, Inc.

Established 1891

Main Office and Plant: STATEN ISLAND 4, NEW YORK

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Now...Old Drills Good As New!



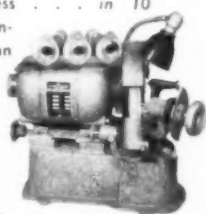
1 INSERT

2 PUSH

3 TWIST

4 GRIND

The BLACK DIAMOND Drill Grinder restores a worn drill to like-new precision sharpness . . . in 10 seconds! Any inexperienced man (or woman!) is an expert grinder with this unit. Both lips ground at once . . . web-thinning equally simple! Pays for itself many times over!



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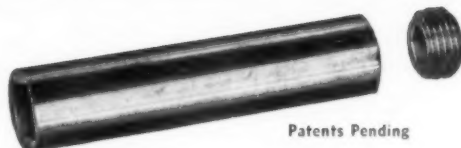
BLACK DIAMOND

SAW &
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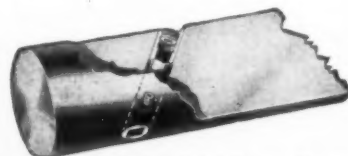
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Patents Pending

One of the most difficult problems in tool making can be solved easily and quickly with Sturdy Square Holed Sleeves. The perfection of broached square holes can be had in boring bars, milling cutters and many other applications at a small fraction of the cost of imperfect hand-made square holes. The sturdy Square Holed Sleeve consists of a round sleeve with a perfectly square hole broached through the center. This hole is tapped at one end to receive a back-up screw which is furnished with the Sleeve. The Sleeve can be sweated or pressed into a drilled and reamed hole to make a perfectly square accurate hole in a very few minutes.



The sturdy Square Holed Sleeve will save you many hours and many dollars in the making of boring bars, tool holders and other tools requiring square holes.

SLEEVES MADE IN FOLLOWING SIZES:
3/16, ¼, 5/16, ¾, 7/16, ½, ¾, 1"

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Literature

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OK series 3600
the **BLACK ANGUS** of face mills with...



More Beef in the Body

For the heaviest cuts that the biggest milling machines can pull.

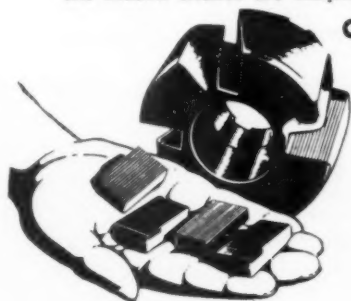
OK Face Mills, size for size, have more weight, more substance, more beef in the body. And blades are huskier with a greater proportion of carbide available for cutting. It is a proven fact these cutters remove more metal in a given period than other cutters which are complicated and weakened by recesses for screws, pins, gibs or locking devices.

OK cutters consist of just two components — the body and the blades. Blades are simple wedge-shaped* blocks, ser-

rated on one face with matching serrations in the body. They are solidly seated by a driving fit, easily extracted with a drift, and stay put under the fastest speeds and heaviest feeds. The simple strength and ruggedness permit the placement of more blades in the fine pitch series and heavier blades in the coarse pitch series.

You need the OK competitive advantages. Take your toughest job and let OK engineers have a go at it.

OK CUTTERS OUTPULL ALL OTHERS



THE



TOOL COMPANY, INC.
Milford, New Hampshire

*The wedge is the world's simplest and strongest basic mechanical device.

Now you can cut those machining costs!!!



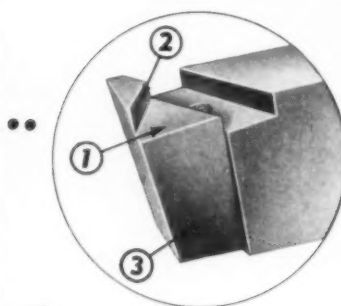
NU-TOOL

Mechanical Tool Holders

Used with NP "Throway" Carbide Inserts

**Here's
where the
difference
pays off!**

*Greater Tooling
Economy*



**More Accurate
Indexing...
Rugged Design!**

1. Solid, hardened and precision ground tip-seating surface (no shims required).
2. Solid backing for cutting thrust . . . both insert and clamp register against solid stops.
3. One-piece alloy steel holder heat-treated to 40-45 Rockwell "C".
4. Only 3 parts mean lower first cost . . . fewer replacement parts . . . smaller inventories . . . Carbide Mechanical Chip Breaker included in price of tool.
5. Only one size NP "Throway" Carbide Insert used in all 3 triangular styles TA, TB and TF.
6. Six carbide cutting edges without grinding . . . Insert can be indexed without resetting for size.

When used with NP Controlled Quality Carbide "Throway" Inserts, the NP Nu-Tool Mechanical Tool Holder paves the way toward faster production and increased production savings for you. Call your nearest Newcomer Sales Engineer . . . let him show you why Nu-Tools can cut your machining costs.

Ask your Newcomer representative for information about NP Econo-Clamp Tools for use with triangular, square and round standard or "Throway" NP Carbide Inserts.

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LATROBE, PA.

General Sales Office: 512 Franklin Ave., Pittsburgh 21, Pa.
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UNIVERSAL DRILL BUSHINGS

INSURE PERFECT ALIGNMENT AND LONG LIFE OF PRODUCTION TOOLS

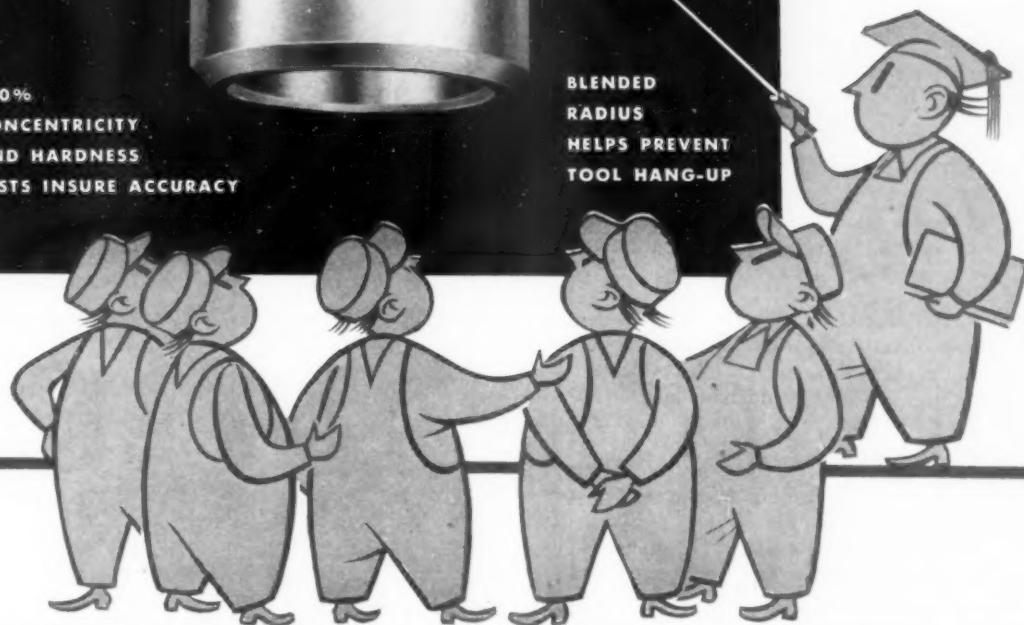
SUPERFINISH
BORES REDUCE
TOOL WEAR

100%
CONCENTRICITY
AND HARDNESS
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KNURLED
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GOOD GRIP

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HELPS PREVENT
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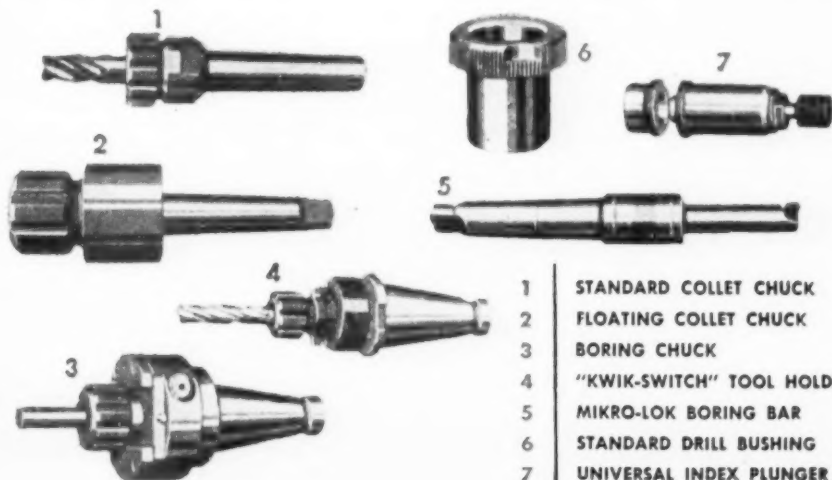
Universal Drill Bushings are available in a complete range of standard sizes and lengths. Special sizes made to order. Write to Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.; or the home office.



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**UNIVERSAL
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MICHIGAN



- 1 STANDARD COLLET CHUCK
- 2 FLOATING COLLET CHUCK
- 3 BORING CHUCK
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- 5 MIKRO-LOK BORING BAR
- 6 STANDARD DRILL BUSHING
- 7 UNIVERSAL INDEX PLUNGER

Tough grinding jobs?

Check **Vulcanaire**
high speed precision
grinding heads!



Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

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Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

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Vertical adaptor for Surface Grinders. Grinding small slots



Horizontal application. Grinding a shoulder Punch.

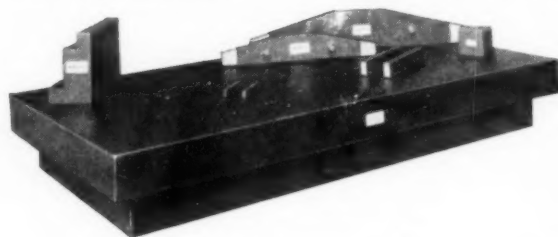
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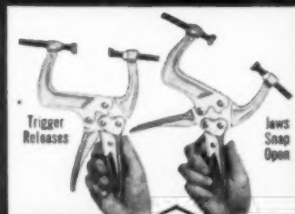
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NOW, ANOTHER

DE-STA-CO FIRST...

3 NEW PORTABLE CLAMPS WITH

TRIGGER-RELEASE!



Model 484



Model 482



Model 486

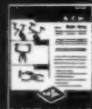
Instant easy action enables operator to release clamp with one hand!

TRIGGER-RELEASE—Finger pressure on Trigger instantly throws jaws wide open, ready for next clamping action.

GREATER CLAMPING PRESSURES—Up to 1200 pounds may be exerted. Normal operating pressures of 300 to 500 pounds are easily obtained.

RUGGED CONSTRUCTION—60% heavier heat-treated forged components. Hardened bushings locked with spun rivet.

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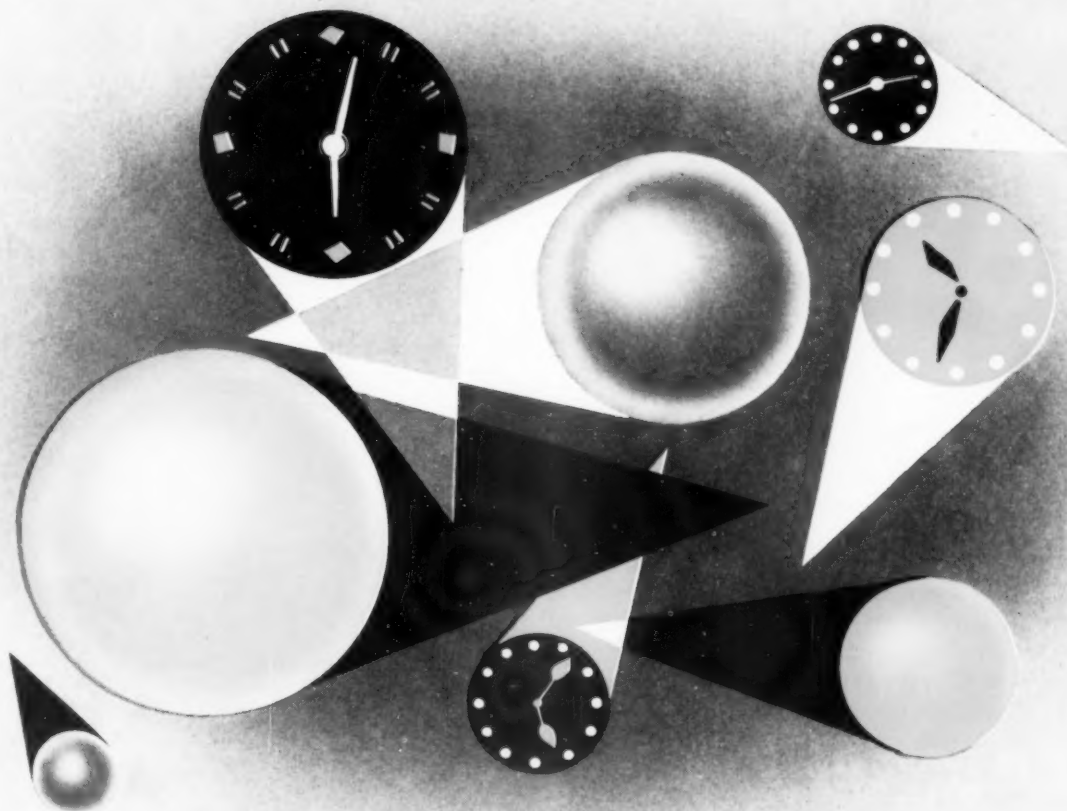


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World's FIRST Line of TOGGLE CLAMPS

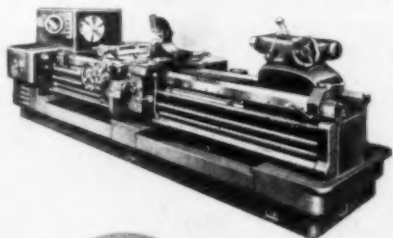
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We can't buy any more than the number of hours we are allotted each day or the number of days of our years. Yet we have individual choice in the matter of how we use our time—a choice that guides the outcome of our lives. Industry has long known that the secret of success lies in taking advantage of each unvarying minute. In that regard we'd like to tell you about the Axelson lathe, the machine that helps your operators work, not harder, but more effectively, so that each minute—each hour—is more productive. May we call on you?



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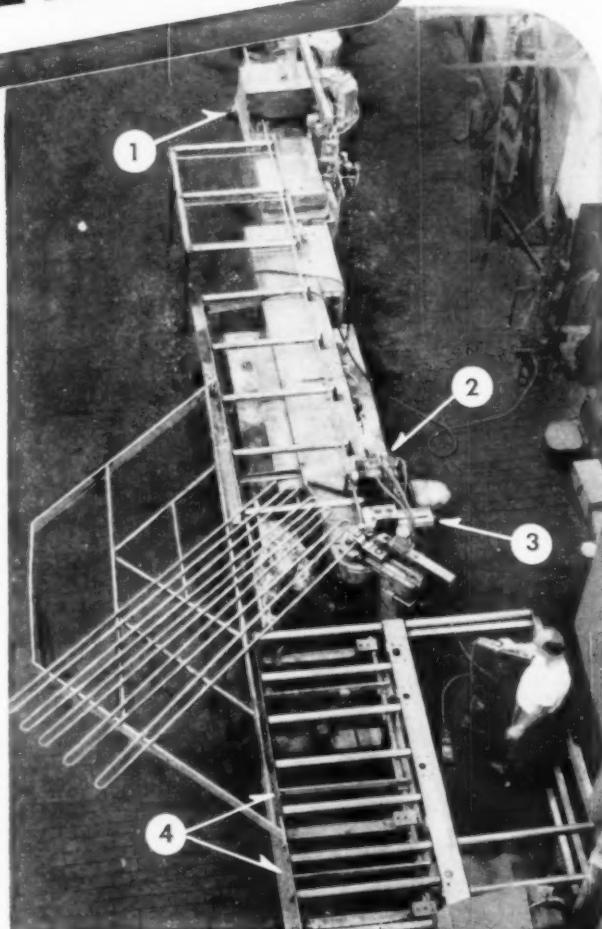
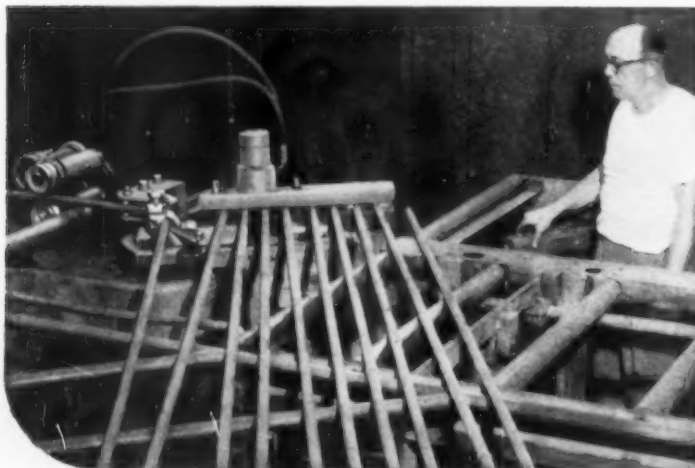
See Us At
BOOTH 555
Production Show,
Navy Pier - Sept. 6-16

How Serpentine Coils Are Now Produced in One Continuous Operation on PINES Size 1¼ Production Bender

● At Carrier Corporation, Syracuse, N. Y., large serpentine air conditioning coils are now completely formed in one, continuous bending operation on a Pines Size 1¼ Production Bender equipped with a flash welder, automatic feed roll, and turn-over fixture. By former methods, three machines were required to meet production needs, and after bending, from 64 to 128 welds were necessary to fabricate a complete cooling unit. In addition to the slow, inconvenient welding procedure, a considerable amount of stock cutting and work handling was required.

COILS NOW PRODUCED AT 200 BENDS PER HOUR

Today, with the new Pines equipment, complete serpentine coils are now formed with little work handling. Straight lengths of stock are butt-welded together before bending which permits completing the coils in one, continuous operation. This method reduces the number of welds and stock cutting because long lengths of stock are used. Scrap losses are reduced as much as 80%, and since the entire operation is mechanized, work handling is substantially reduced. The result — complete coils are now produced on one machine with two operators at a production rate of 200 bends per hour.



▲ Over-all view of Pines installation at Carrier Corp., Syracuse. Handles standard pipe ranging from ¾" up to 1¼" sizes. The unit combines (1) welder, (2) feed roll, (3) bender, and (4) turn-over fixture.

WRITE FOR *Free* DATA SHEETS

For more information on latest developments in production bending, write for copies of "Pines News". Describes and illustrates how production bending is helping cut manufacturing costs on a wide variety of jobs.

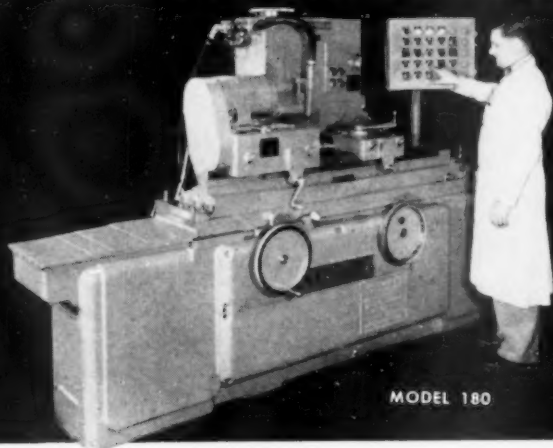


PINES ENGINEERING CO., INC.
Specialists in Tube Fabricating Machinery 693 WALNUT • AURORA, ILLINOIS

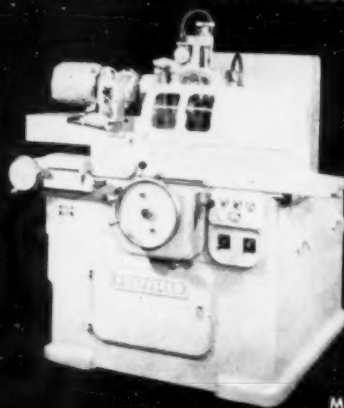
PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

◀ Closeup view showing automatic feed roll and tooling. Hinged clamp die with angular cam surface and mating plate permits clamping workpiece without interfering with formed coil. Long, horizontal clamp holds ends of coils to prevent distortion during sweep of bending arm.

Grind **PRECISION FORMS, GROOVES and**
LANDS *in Record Time*
 with **SHEFFIELD'S** CRUSHTRUE MULTIFORM GRINDERS



MODEL 180



MODEL 109



Servo Mechanism Sleeve

The seven grooves of this servo mechanism sleeve are crushtrue ground from the solid to a tolerance of .001" on spacing and .002" on minor diameter in 55 seconds. Material, SAE 52-100; Rockwell, 58-60 C; depth of plunge grind, .145".

Forms and grooves are precision ground on these machines with comparable speed and economy.

For complete details write to Department 810, The Sheffield Corporation, Dayton 1, Ohio, U.S.A.

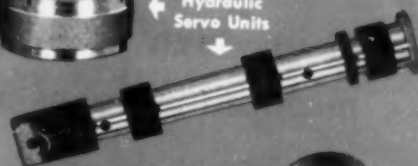


Bearing Race

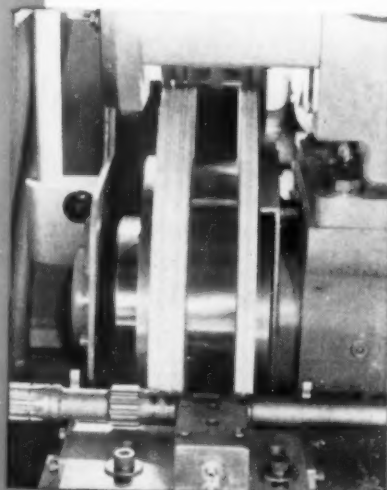
Aircraft Servo Component



Hydraulic Servo Units



Self-aligning Bearings



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Crushtrue Roll



SHEFFIELD
 MANUFACTURE AND MEASUREMENT FOR MANKIND

See this at the Machine Tool Show, Booth 1305.



big news in tooling plate is Dow Magnesium!

It's light in weight, the price is low, machinability is unsurpassed . . .
magnesium opens a new door to low-cost tooling for you

Dow's new magnesium tooling plate is now available from Dow distributors across the country. This is the lightest tooling plate ever made—a full third lighter than aluminum and one-fourth the weight of steel. Yet you'll find its price lower than other commonly used tooling materials.

Dow magnesium tooling plate is rolled—not cast—providing larger sizes, freedom from porosity, better toughness, and a smooth mill surface. Thermal flattening assures positive di-

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Extra rigidity, good weldability and high strength-to-weight ratio, too, make magnesium plate ideal for jig, fixture and tooling uses. Call your Dow magnesium distributor, today, for price and delivery data, or write THE DOW CHEMICAL COMPANY, Midland, Michigan.

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MACHINE TOOL
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at **BOOTH**
1213

THE
MACHINE TOOL
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 CHICAGO, ILL.
 SEPT. 8-12, 1955
 INTERNATIONAL AMPHITHEATRE

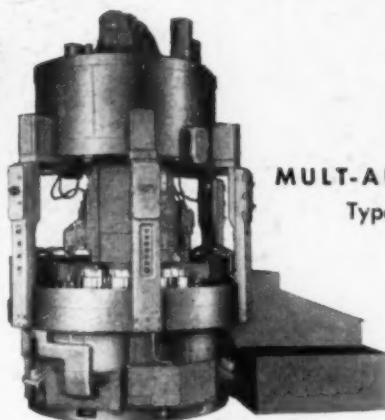
SEVENTY FIFTH
BULLARD
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"Seen the Show"...

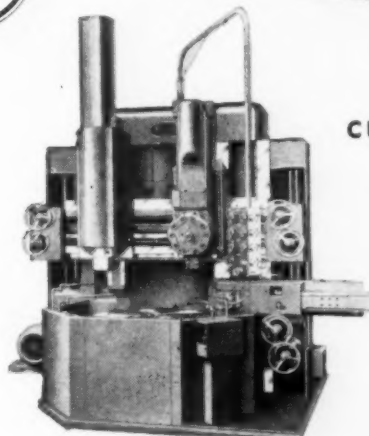
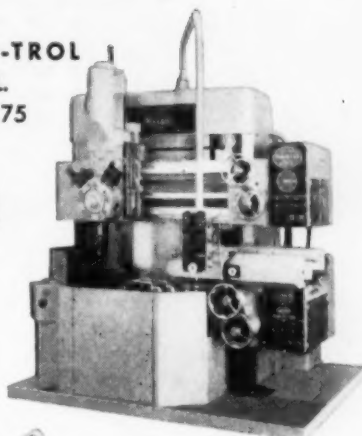
unless you visit The Bullard
 Exhibit for here are displayed
 not merely re-designed but com-
 pletely new machines that take
 full advantage of modern tech-
 nological advances including
 single station Pendant Control.

The Bullard Co.
 Bridgeport 2, Connecticut



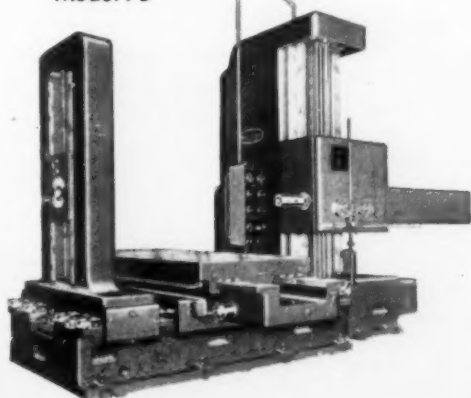
MULT-AU-MATIC
 Type "L"

MAN-AU-TROL
 V.T.L.
 Model 75



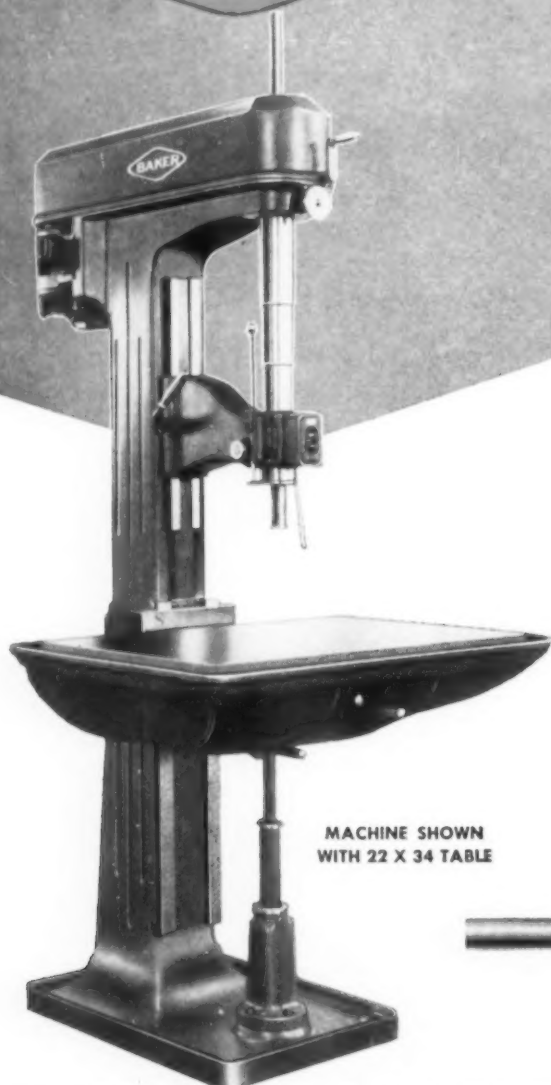
CUT MASTER
 V.T.L.
 Model 75

HORIZONTAL BORING, MILLING
AND DRILLING MACHINES
 Model 75



BAKER

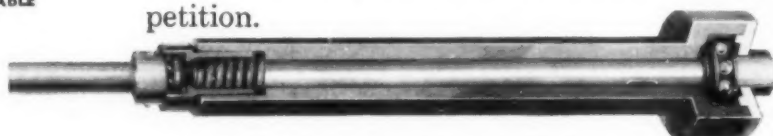
SENSITIVE DRILLING MACHINES



MACHINE SHOWN
WITH 22 X 34 TABLE

- ★ IMMEDIATE DELIVERY
- ★ MULTIPLE SPLINED SPINDLE
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- ★ PRELOADED SPINDLE (See Cutaway)
- ★ TWO PIECE FRAME CONSTRUCTION FOR FLEXIBILITY

The Baker line of drilling and boring machines is now more complete than ever before, with the addition of the new Baker Sensitive. Baker's 75 years of engineering experience in the drilling and boring field is now at your disposal in light-duty sensitive type units. The machine illustrated is *best* for light-duty drilling operations. Let Baker Representatives tell you how the Baker will save you money and put you ahead of competition.



Cutaway shows why the Baker spindle preloading prolongs drill life. Ball bearings also lengthen tool life. These, and many other features mean *money* to you.

GENERAL SPECIFICATIONS KTVS VERTICAL MOTOR DRIVE

1" CAPACITY IN CAST IRON, 3/8" IN STEEL	
Spindle centerline to column face.....	12"
Spindle speeds—with 1200 R.P.M. motor.....	275-1375*
Spindle travel.....	7"
Rack travel.....	10"
Table adjustment.....	32 1/2"
Morse Taper in spindle nose.....	#2 or #3

*Speed adjustment between the lowest and highest speed is INFINITE through selector.

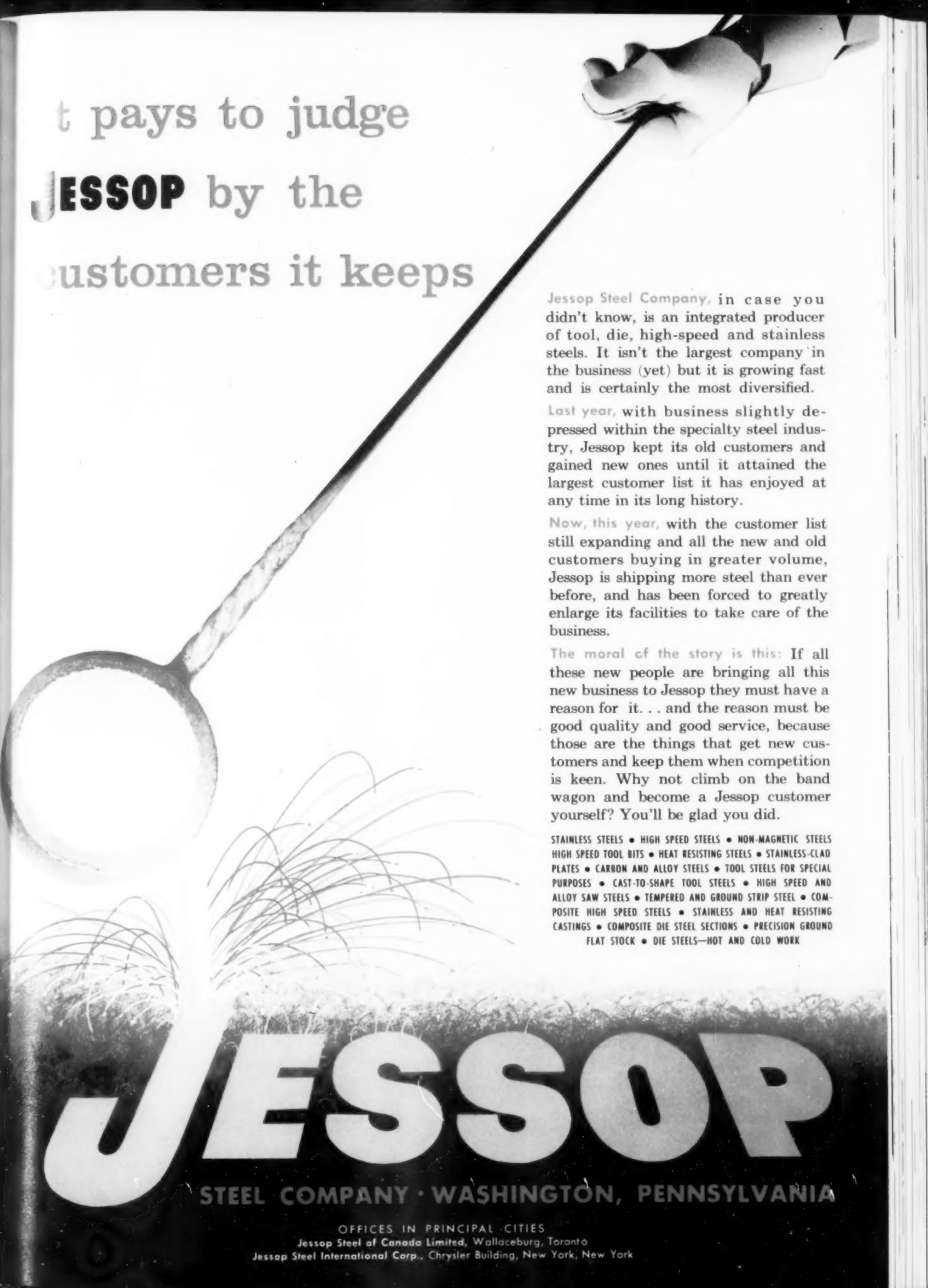
See us at

BOOTH 1421



BAKER BROTHERS, INC.
TOLEDO, OHIO

DRILLING...TAPPING...KEYSEATING...CONTOUR GRINDING MACHINES



It pays to judge
JESSOP by the
customers it keeps

Jessop Steel Company, in case you didn't know, is an integrated producer of tool, die, high-speed and stainless steels. It isn't the largest company in the business (yet) but it is growing fast and is certainly the most diversified.

Last year, with business slightly depressed within the specialty steel industry, Jessop kept its old customers and gained new ones until it attained the largest customer list it has enjoyed at any time in its long history.

Now, this year, with the customer list still expanding and all the new and old customers buying in greater volume, Jessop is shipping more steel than ever before, and has been forced to greatly enlarge its facilities to take care of the business.

The moral of the story is this: If all these new people are bringing all this new business to Jessop they must have a reason for it. . . and the reason must be good quality and good service, because those are the things that get new customers and keep them when competition is keen. Why not climb on the band wagon and become a Jessop customer yourself? You'll be glad you did.

STAINLESS STEELS • HIGH SPEED STEELS • NON-MAGNETIC STEELS
HIGH SPEED TOOL BITS • HEAT RESISTING STEELS • STAINLESS-CLAD
PLATES • CARBON AND ALLOY STEELS • TOOL STEELS FOR SPECIAL
PURPOSES • CAST-TO-SHAPE TOOL STEELS • HIGH SPEED AND
ALLOY SAW STEELS • TEMPERED AND GROUND STRIP STEEL • COM-
POSITE HIGH SPEED STEELS • STAINLESS AND HEAT RESISTING
CASTINGS • COMPOSITE DIE STEEL SECTIONS • PRECISION GROUND
FLAT STOCK • DIE STEELS—HOT AND COLD WORK

JESSOP

STEEL COMPANY • WASHINGTON, PENNSYLVANIA

OFFICES IN PRINCIPAL CITIES

Jessop Steel of Canada Limited, Wallaceburg, Toronto

Jessop Steel International Corp., Chrysler Building, New York, New York



...naturally it's

AMERICAN MONORAIL

This American MonoRail Monotractor unit, recently installed in a rug and carpet warehouse, dispatches hard to handle, big bulky loads over a wide area. Fully automatic, with finger-tip control, with a hoist capacity of 1,000 pounds, this installation is **SAVING 200 MAN HOURS PER WEEK.**

*For Continuous Flow of Light Loads
Use Landahl Chainless Conveyors*

This is another of the many examples of American MonoRail engineering for low-cost, efficient overhead handling. Let your American MonoRail representative explain the versatility, low cost and low maintenance of American MonoRail equipment. Consultation in connection with any handling problem is available without obligation.



AMERICAN

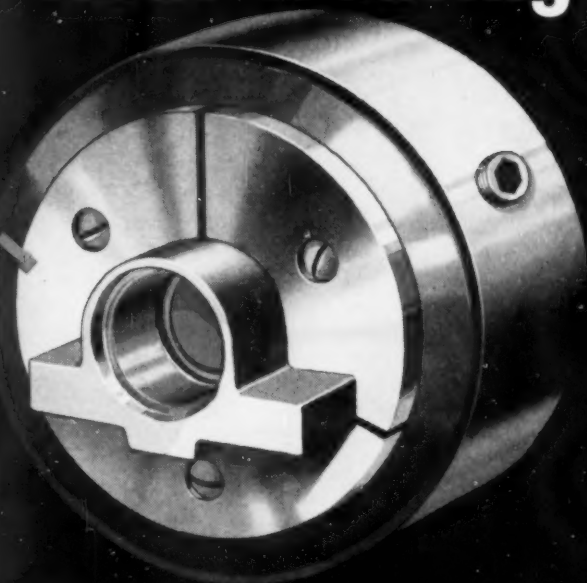
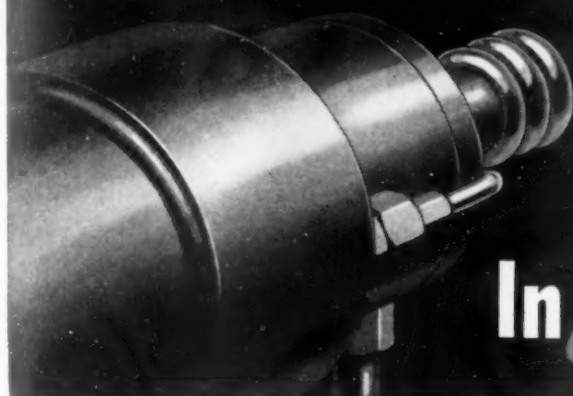
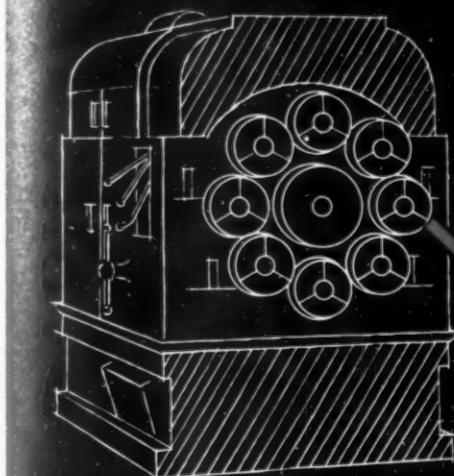
OVERHEAD
HANDLING
EQUIPMENT

MonoRail

COMPANY

13133 ATHENS AVENUE • CLEVELAND 7, OHIO
[IN CANADA—CANADIAN MONORAIL CO., LTD., GALT, ONT.]

Now... Machining and Heat Treating



In *One* Operation!

with TOCCO Induction Heating

Mechanics Universal Joint Division of Borg-Warner Corporation now combines automatic heat-treating and metal-working operations on the same machine!*

A Tocco Inductor Coil, matched to one spindle of a multiple spindle automatic screw machine, heat treats the inside diameter of automotive trunnion cups—after they have been completely formed on the same machine tool. Twenty-two, 20 and 50 kw, 450,000 cycle TOCCOtron Induction Heating units and 44 automatic screw machines (installed here and in other plants) make up this high-speed production team.

THE OHIO CRANKSHAFT COMPANY
Dept. G-9, Cleveland 1, Ohio

This new method permits the use of SAE 1144 steel and eliminates costly, time-consuming copper plating and carburizing operations formerly required. Heating and quenching cycles total approximately 10 seconds per part, and production is in excess of 300 parts per hour from each machine.

If your products or their components require heat treating, soldering, brazing or forging it will pay you to investigate TOCCO for better, faster ways of producing them at lower unit cost.

Write for free catalog—**TOCCO Induction Heating**



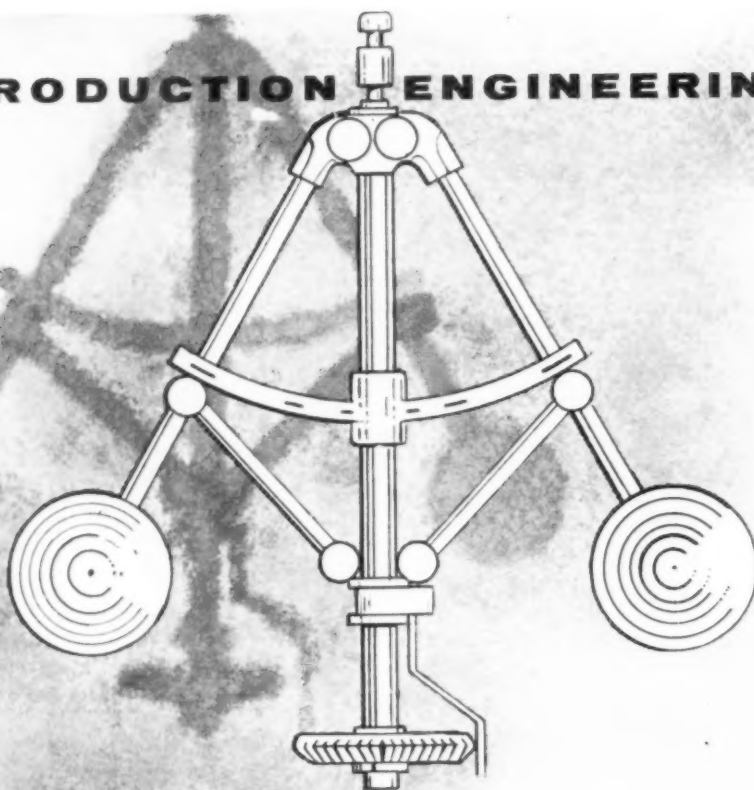
TOCCO

*Trade Mark Reg.
U. S. Pat. Off.



SEE this application
in operation at
Cone Automatic Machine Co.
BOOTH 401
National Machine Tool
Builders' Show
CHICAGO—Sept. 6-16.

PRODUCTION ENGINEERING SHOW



AMPCO* METAL helps keep the "auto" in automation

... resists wear, corrosion and other forces
that shorten machine life —
to keep your production rolling

A breakdown on an automated production line means expensive delays. That's why critical parts made from Ampco Metal pay their small cost many times over.

Ampco Metal is often called "The Metal Without An Equal" — and for good reason. This remarkable series of special copper-base alloys stand up to most destructive forces that reduce machine life, halt production.

For instance, Ampco has outlasted steel as much as 60 times in applications where severe sliding wear and heavy shock loads are present. It's a remarkable bearing material — especially when used against hardened steels. Gears, bushings, wear strips, etc. have operated for years without visible wear. It retains mechanical values under conditions of high temperature or extreme cold. It reduces sound and vibration. And its high strength-to-weight ratios permit the use of lighter sections that are strong.

What's more, Ampco Metal is available in any form you need and can be machined to your specifications in our modern Machine Shop. Think of Ampco Metal, Inc. as a "one-source" supplier from raw materials to finished products.

Get the full story on this unique engineering material at the Production Engineering Show or write us for complete information.

*Reg. U. S. Pat. Off.

*See Our
Exhibit*

Booth 516

•
Production
Engineering Show

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Navy Pier, Chicago

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September 6 thru 16.



Sole Producer of Genuine Ampco Metal

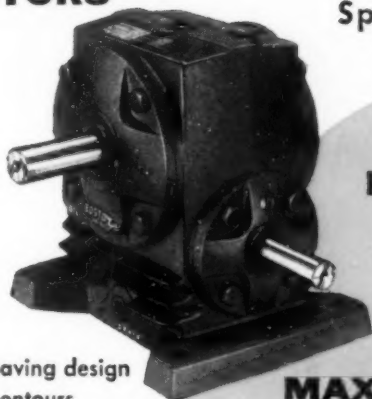
AMPCO METAL, INC.

Dept. TE-9
Milwaukee 46, Wisconsin
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D-47

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AT THE NAVY PIER**
Production Engineering Show

New REDUCTORS



NEW space saving design
NEW clean contours
NEW gearing efficiency
NEW cooling fins
FAN COOLING optional
on larger sizes

See the **NEW**
BOSTON GEAR
Speed Reducers



Designed by Boston Gear
specialists to deliver

Certified
**MAXIMUM HORSEPOWER
PER DOLLAR**

by Independent Laboratory tests

**Every feature you want —
any model you need**

FROM STOCK

New RATIOMOTORS

New COMBINATION Construction

Gear reduction unit and
easily detachable standard
end-mounted motor — com-
bined for big maintenance
savings. Permits (1) replace-
ment of motor without
disturbing gear unit,
(2) replacement of original
motor at any time with motor
of special characteristics
(totally-enclosed, etc.)



New FLANGED REDUCTORS

The Ratio motor gear reduction unit; supplied without motor.
You buy and attach the motor of your own choice.

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DISTRIBUTOR

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Worm gear on top

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Worm gear under

Vertical Right Angle Drive

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Double Reduction

Vertical Right Angle Drive
Double Reduction

Horizontal Right Angle
Ratiomotor

Horizontal Parallel
Ratiomotor
Double Reduction

Vertical Right Angle
Ratiomotor

Vertical Right Angle
Ratiomotor
Double Reduction

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**108 MODELS
1064 STANDARD
STOCK UNITS**

Get your copy of
NEW CATALOG R-56
for specifications
and selection data

Look under "GEARS" in the Yellow Classified Section of your Telephone Directory for the BOSTON Gear Distributor nearest you.

55BG-MTS-14

MACKLIN WHEELS *for your every need*



MACKLIN has long had the reputation for producing the highest quality grinding wheels for all types of production and specialized grinding requirements. Macklin's contributions to the general improvement of grinding wheels in their twenty-eight year history have been many.

The latest, the patented and proved M M process bids well to be one of the greatest single improvements of all time. The unique construction of this new wheel with its self dressing qualities makes it a must on those difficult jobs that have been causing you trouble.

Regardless of what your grinding problem may be, or even though you may not feel that you have a problem, you owe it to yourself to fully investigate how Macklin can assist you in improving your grinding costs.

Call your Macklin distributor or factory man today.

MACKLIN COMPANY

**Manufacturers of GRINDING WHEELS AND OTHER ABRASIVE PRODUCTS
JACKSON, MICHIGAN**

HOW

WALES **Fabricators**

produce **FASTER and GREATER**
SAVINGS...

NO OTHER MACHINE LIKE IT!

Rapid interchangeability of punches and dies for various hole diameters plus faster notching and nibbling operations provide the typical astounding time studies described below.

How long would it take you to make similar parts?

Wales Fabricator, the only machine of its kind, permits working direct from blueprints or operation sheets . . . *no templates required.*

ELECTRONIC CHASSIS 12½" x 11½", with 118 holes and 4 notches was completed including setup in only 32.45 minutes and subsequent pieces in

6.44 minutes.

A part of **FARM EQUIPMENT**, 72½" x 22" with 32 holes and nibbled cut out was finished including setup in only 12.01 minutes, subsequent pieces in

2.32 minutes.

AN AIRCRAFT part 7½" x 4½" with 15 holes and 1 notch was produced including setup in only 3.52 minutes and subsequent pieces in only

54 seconds.

Part of an **ELECTRIC REFRIGERATOR**, 39¾" x 8½" with 10 holes and 4 notches was fabricated including setup in only 5.61 minutes and subsequent pieces in only

37 seconds.

It is too BIG a story to tell here so write today for the complete, fully-illustrated, functionally colored Wales Catalog 10-AA.

WALES-STRIPPIT CORPORATION

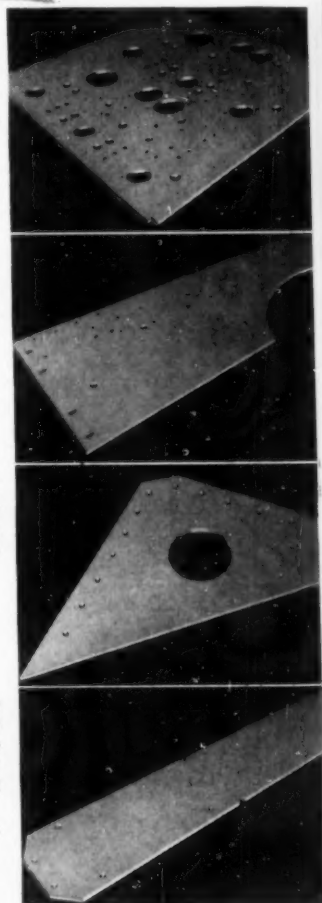
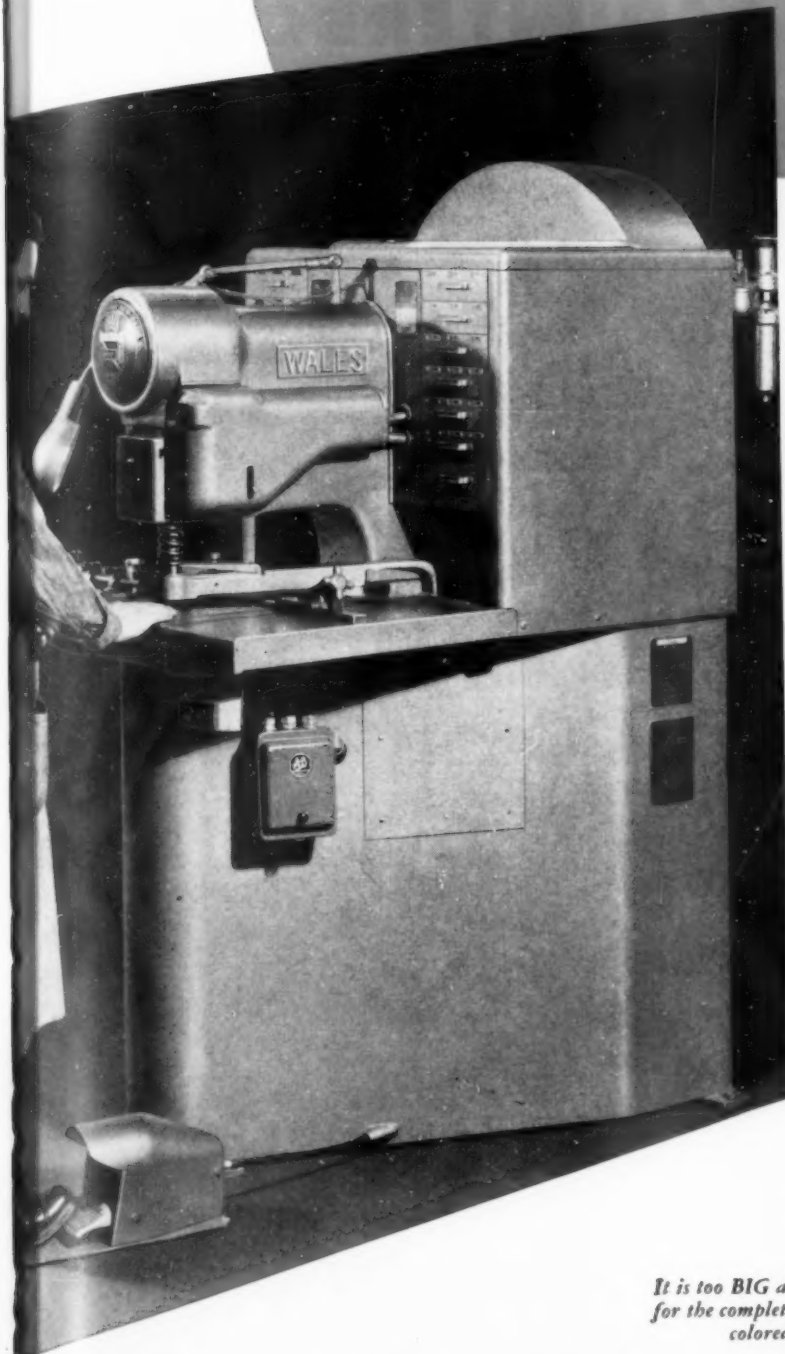
George F. Wales, Chairman

593 Payne Avenue, North Tonawanda, N. Y.

(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment



NOW!

A COMPLETE LINE OF STANDARD CARBIDE TIPPED COUNTERBORES



Standard tungsten carbide tipped cutters in both Pin and Radial Drive are now carried in stock for immediate shipment. Diameters range from $\frac{3}{8}$ " to 2" in $\frac{1}{16}$ th sizes, and from 2" to 3" in $\frac{1}{8}$ th sizes.

Improved flute design provides better chip disposal and longer carbide tips insure longer tool life. Minimum root diameters permit the use of a greater range of standard Eclipse Pilots.

Special carbide tipped tools in various drives will be quoted on request.

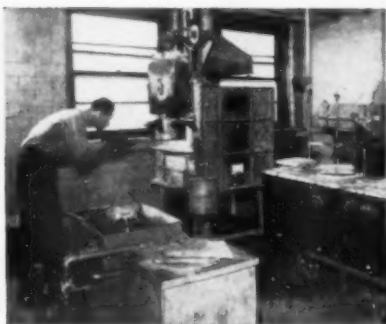
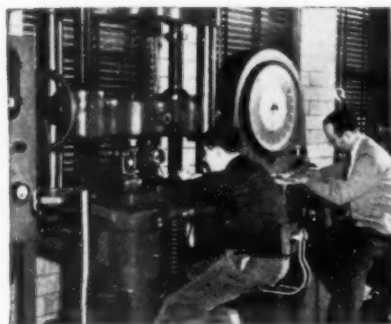


ECLIPSE COUNTERBORE COMPANY

1600 BONNER AVE., DETROIT 20, MICHIGAN

Vanadium-Alloys Steel Company

• advanced
research

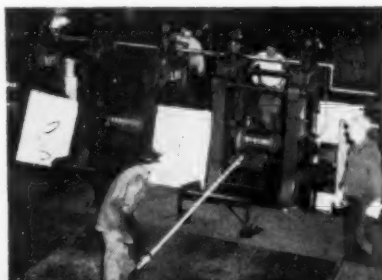


the facts behind

first quality

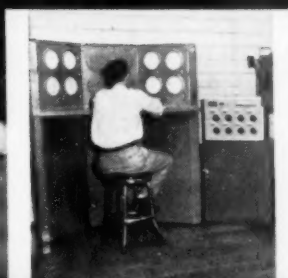
in tool steels—and in service!

Pictured here are some of the tangibles that assure First Quality in Vanadium-Alloys Steel Company products. Above these modern facilities, however, is the calibre of the men who operate them—men whose experience, in many cases, is as old as the Company—and men in every case whose talents are devoted solely to the production of fine Tool Steel and *nothing less*. Visit us, and see for yourself. We welcome every opportunity to serve you.



- careful melting
- thorough forging
- accurate rolling

complete
inspection



• Deep Etch • Supersonic • Spectrographic • Pyrometric • Zyglo • Magnaflux



- strategic stocks
- fast deliveries



Write for your
copy of our new
68 page
Tool Steel Guide—
free on request



VANADIUM-ALLOYS STEEL COMPANY

Manufacturers of First Quality Tool and Die Steels

Latrobe, Pennsylvania

COLONIAL STEEL DIVISION • ANCHOR DRAWN STEEL CO.

In Canada: Vanadium-Alloys Steel Canada Limited, London, Ontario

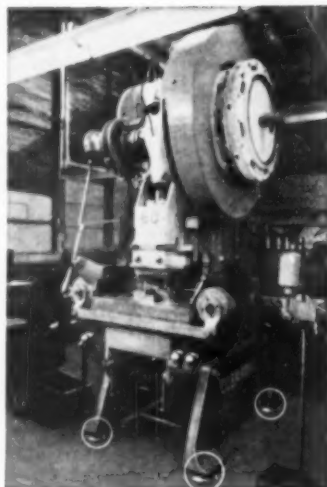
ROBINSON MACHINERY MOUNTINGS

Preferred for Vibration and Shock Control

All-Metal

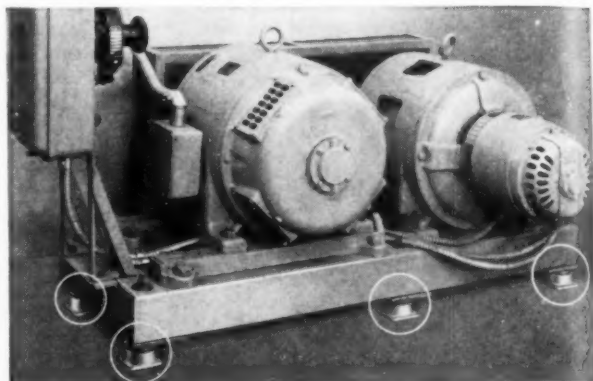
Met-L-Flex*

(TRADE MARK)



*Registered Trade Mark for the All-Metal Met-L-Flex load-carrying resilient cushions fabricated of stainless steel wire which were developed and pioneered exclusively by Robinson Aviation, Inc.

See below for description of mounts utilized.



Robinson Met-L-Flex Mounts, in world-wide use for airborne equipment, have now been adapted to the mounting of machinery. Their use will effect immense economies in time and money.

NO RUBBER — Deterioration eliminated

NO LAGGING — Bolting to floor unnecessary

QUICK INSTALLATION — Special tools not required

MACHINE MOBILITY — Flexible production lines

LESS MAINTENANCE — Machines stay aligned

LIFETIME PERFORMANCE — Mounts will not wear out

MORE STABILITY — Machines will not walk

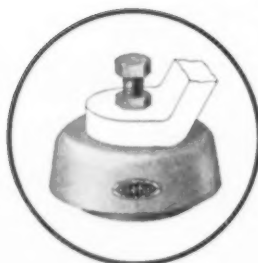
REDUCED NOISE — Structure-borne rumble eliminated

CLOSER TOLERANCES — Product quality improved

INCREASED OUTPUT — Faster machine speeds possible

INCREASED PROFITS — Fewer rejects

IMMEDIATE SERVICE — Less down time for installation

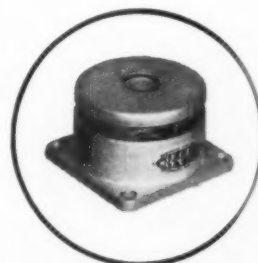


W139 "ADJUST-O-MOUNT". Heavy duty shock and vibration unit mount for rotating industrial machinery. Incorporates advanced leveling feature for quick, simple alignment of machines without the use of special tools.

Recommended for industrial machines, such as grinders, broaching, milling, boring and drilling machines, motors, generators, pumps and compressors. Available in 4 load ranges from 250 to 4000 lbs. per unit. Larger capacities available. Natural frequency: 12-18 c.p.s.

SERIES W300. Heavy duty shock and vibration mount recommended for rotating machinery, presses, generators, pumps, compressors, milling machines and other heavy industrial machinery. Available in 3 load ranges from 100 to 1500 lbs. per unit.

Natural frequency: 12-16 c.p.s.



Send for Bulletin No. 850, "Robinson Vibration and Shock Mounts for Industry". "Trends" sheets Nos. W100 and W101 give engineering information on the 2 mounts illustrated.

ROBINSON AVIATION INC.
TETERBORO, NEW JERSEY
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INDUSTRIAL DIVISION

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JUST LIKE PUTTING MONEY IN YOUR POCKET

When you use R and L TOOLS on your Automatic Screw Machines and Turret Lathes you cut costs and increase production!

These facts are attested by the tremendous amount of **repeat orders** we receive for R and L TOOLS . . . Satisfied customers ordering more and more of these tools, for they like their quality — guaranteed not to bend or give way . . . They like the precision work which can be performed with R and L TOOLS . . . And best of all, they like the money R and L TOOLS save them!

Have you tried R and L TOOLS? . . . Once you do, you'll never be satisfied with any others . . . And until you do, you are actually losing money!

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1825 BRISTOL STREET • PHILADELPHIA 40, PA.

TURNING TOOL • CARBIDE OR ROLLER BACKRESTS • RELEASING OR NON-RELEASING TAP AND DIE HOLDERS, (ALSO FURNISHED FOR ACORN DIES)
• UNIVERSAL TOOL POST • CUT-OFF BLADE HOLDER • RECESSING TOOL • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL



You save on . . .

- LESS SET-UP TIME
- GREATER PRODUCTION
- LONGER LIFE
- GREATER PRECISION



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- ☐ Please send me your new catalog
☐ Please arrange for no-obligation demonstration of R and L TOOLS

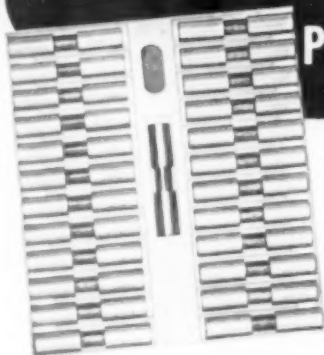
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TE-9

CLOSER TOLERANCES with **DELTRONIC** TENTH PLUG GAUGES



- ★ Size variation by ten thousandths
- ★ Set of 25 costs approximately same as Go and No-Go gauge.
- ★ Available in increments of 1/64" from 1/8" to 1"
- ★ Hardness is Rockwell C62/C64

This new system of precision gauging provides one gauge of nominal size plus 12 gauges of increasingly larger sizes in .0001" increments and 12 gauges of decreasingly smaller sizes in increments of .0001". Each gauge is identified. It is the same size on both ends to double the life in usage.

For further information write Dept. D12.

**DELTRONIC
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NOW YOU CAN HAVE EMBOSSING DIES IN A HURRY

The MIKAY CO. utilizes a process by which steel die plates can be made in as little as 48 hours.

Dies made by this process have been used in the automotive industry for several years.

Technical developments have made greater production possible.

By this process any type of tool steel, annealed or hardened, can be engraved.

Your designs accurately reproduced.

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FOR DRILLING, CORE DRILLING, ROUGH AND FINISHED BORING

The inner race of the GATCO bushing rotates with the tool, piloting the tool accurately below or above the work—or both.

Eliminates expensive tool construction—Reduces tool wear—Prevents seizure and pilot breakage—Especially adapted where precision is required.

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Telephone PLYMOUTH 1472

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Fastest initial and repeat settings
guaranteed accurate within .00015"

LINDNER JIG BORERS

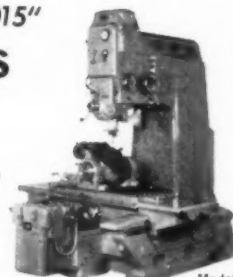
- Direct reading micro-optical measuring system permanently free of wear. Readings in .00005"
- No gauges, blocks or bars
- Table sizes: 44" x 24"; 32" x 16"
- Over 60 delighted users in U.S.A.
- Send for 20 min. demonstration movie film



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Model LB15 with preselective AUTOPOSITIONER

DYKEM STEEL BLUE®

**Stops Losses
making Dies and
Templates**



Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

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... the most **Outstanding Advance** in modern precision surface grinding . .



THE NEW — ALL ELECTRIC

6" x 18"

Reid-o-matic
PRECISION SURFACE GRINDER

FOR BOTH
PRODUCTIVE
AND
TOOL ROOM
GRINDING

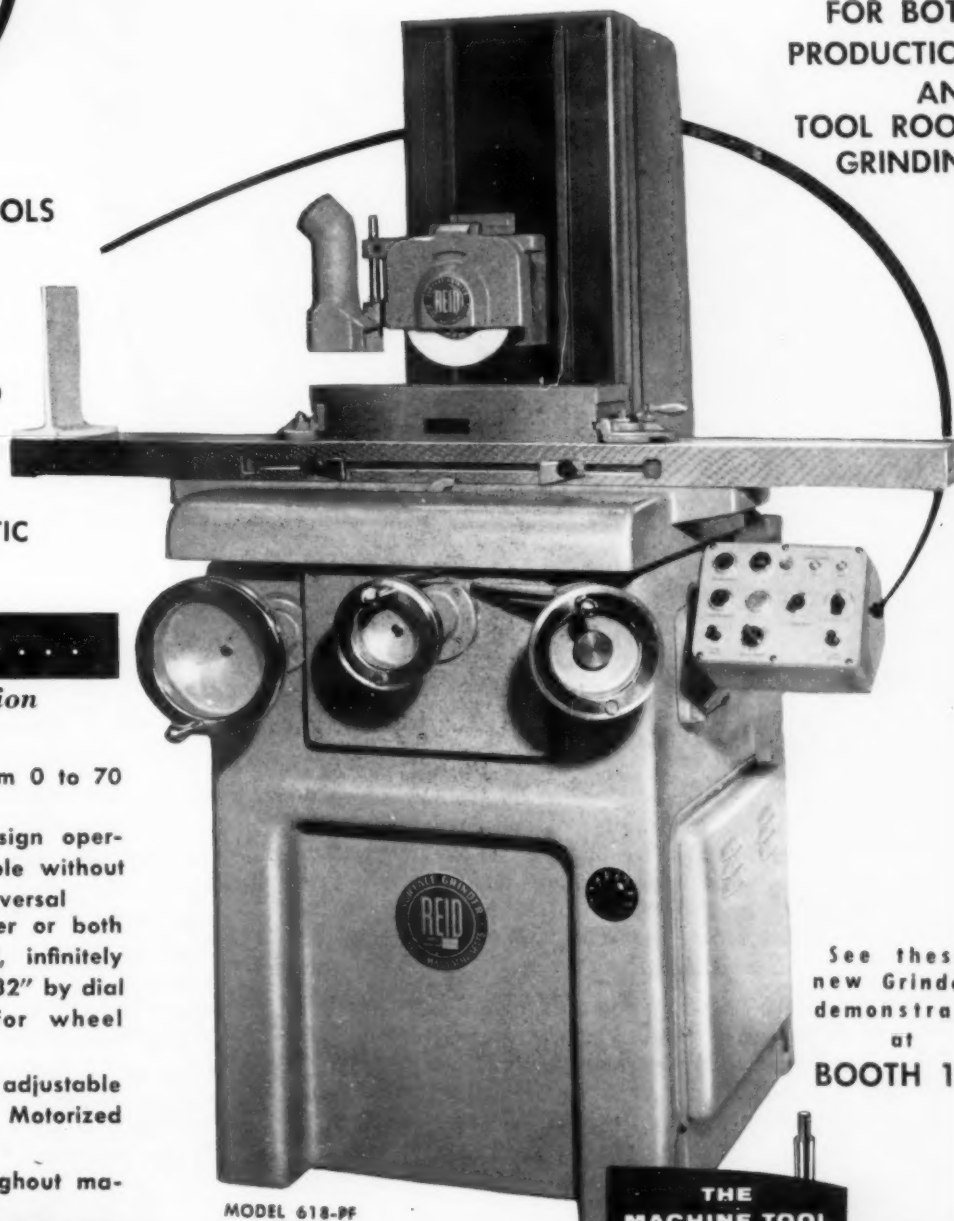
with
PUSH BUTTON CONTROLS
for:

CROSS FEED POWER
RAPID TRAVERSE

RAPID POWER
ELEVATING HEAD

AUTOMATIC CROSS
FEED CYCLING

ADJUSTABLE AUTOMATIC
TABLE TRAVEL



MODEL 618-PF

EXCLUSIVE NEW FEATURES . . .

*Perfected for True Precision
Surface Grinding*

TABLE SPEED: infinitely variable from 0 to 70
feet per minute

TABLE TRAVEL REVERSAL: new design oper-
ates table without
motor reversal

CROSS FEED: instantaneous at either or both
ends of table travel, infinitely
variable from 0 to 7/32" by dial
adjustment (ideal for wheel
dressing)

GRINDING HEAD: new design with adjustable
gibs — 1 H.P. Motorized
Spindle

LUBRICATION: fully automatic throughout ma-
chine

PLUS 2 OTHER NEW MODELS

MODEL 618PT — Power Driven Table

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full unitized construction

See these
new Grinders
demonstrated
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THE
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CHICAGO, ILL.
SEPT. 6-17, 1955

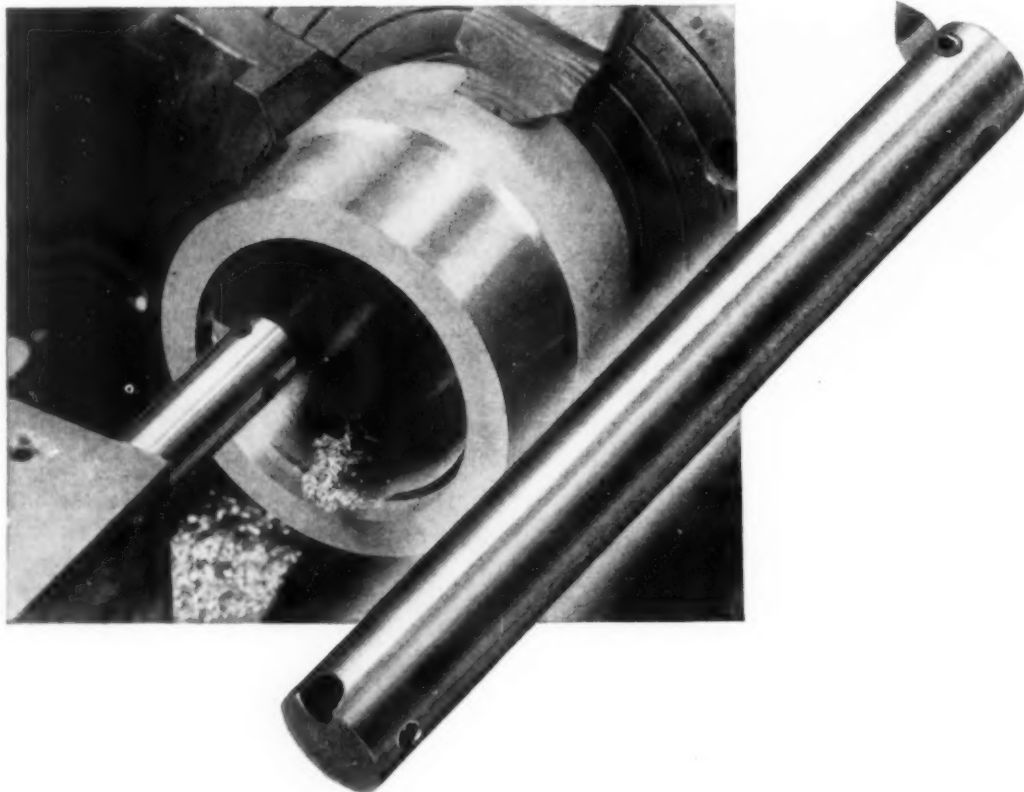
INTERNATIONAL AMPHITHEATRE

Get complete details on these
new rugged Precision Grinders
— write today for Bulletin PF-15



Reid Brothers  **Company, Inc.**

Mallory No-Chat* Boring Bars Can Cut Your Machining Costs



HOW MUCH MONEY and time are being wasted in your shop by chattering tools?

A unique development by Mallory—*No-Chat* boring bars and tool shanks—now puts an end to this waste. Even those tough inside cuts with long overhang of the boring bar can be made with an absolute minimum of tool vibration, and at substantial overall savings in machining cost.

No-Chat boring bars are made of a special high density alloy. Far heavier, more rigid and better heat-conducting than steel, they stop vibration at its source. They cost more . . . but they quickly pay for themselves on the job.

Far more production between grinds. Tools run

cooler. Wear due to vibration is drastically reduced. Down time is slashed.

More metal removed per cut. Machines can be set for heavier cuts without danger of chatter.

Cleaner finish. Reduced chatter often eliminates need for finish grinding. You don't cut chips on the way out.

No-Chat boring bars and tool shanks are re-usable. Tips are readily replaced. This unique metal does not anneal, and has no grain-growth problems.

Write to Mallory today for our Technical Bulletin giving full data on *No-Chat*, and available sizes of stock for use in the tools you are now designing.

*Trade Mark
Patent Applied For

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Electromechanical—Resistors • Switches • Television Tuners • Vibrators
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For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio



right in tune
*...and REX is the standard
 by which all other high speed
 steels are compared*

A tuning fork sounds the *standard pitch* to which musical instruments are compared. There's a recognized standard for high speed steels, too — Crucible REX®.

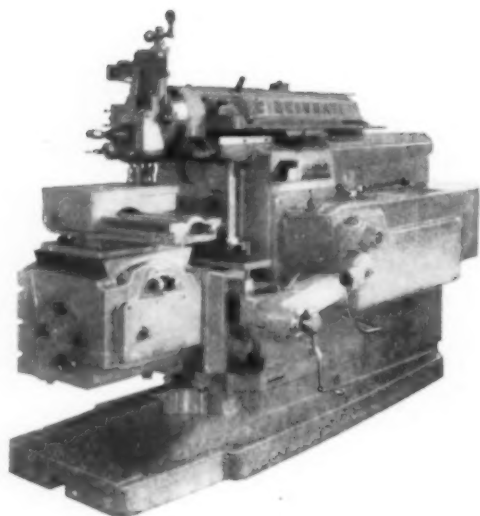
But don't take our word for it. Try REX in your own shop. Compare its structure, finish, hardenability, carbide distribution and general uniformity. Measure the *extra performance* you get. You'll see for yourself why no other tool steel outperforms REX . . . why it's the *standard for comparison* wherever high speed steels are used.

Next time you buy tool steels, be sure of top performance — specify REX. Remember, it's made only by Crucible — and is available from local warehouse stocks, or by prompt mill delivery. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE

first name in special purpose steels

Crucible Steel Company of America



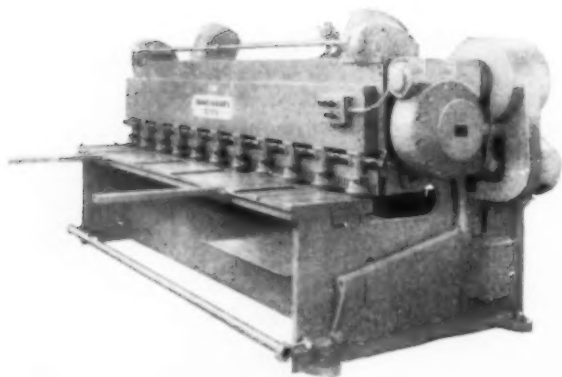
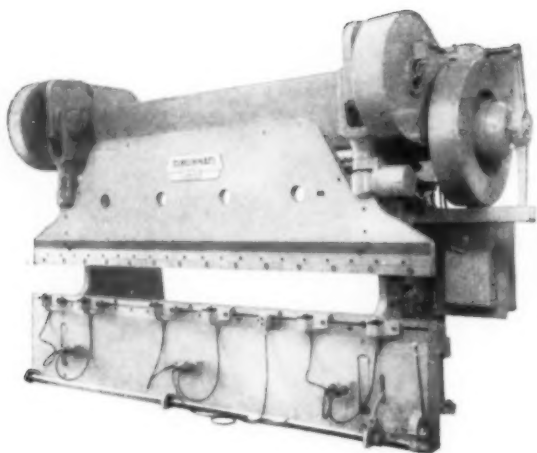
**Important
Announcement**
to the
Metal Working Industry

The Cincinnati Shaper Company

announces a

**5 Year
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on material and workmanship on all
new machines shipped after Septem-
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evidence of the unusual depend-
ability of our machines.



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CINCINNATI 25, OHIO, U.S.A.

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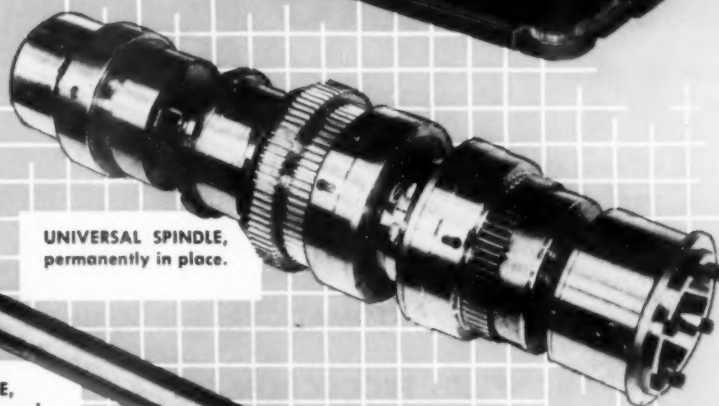
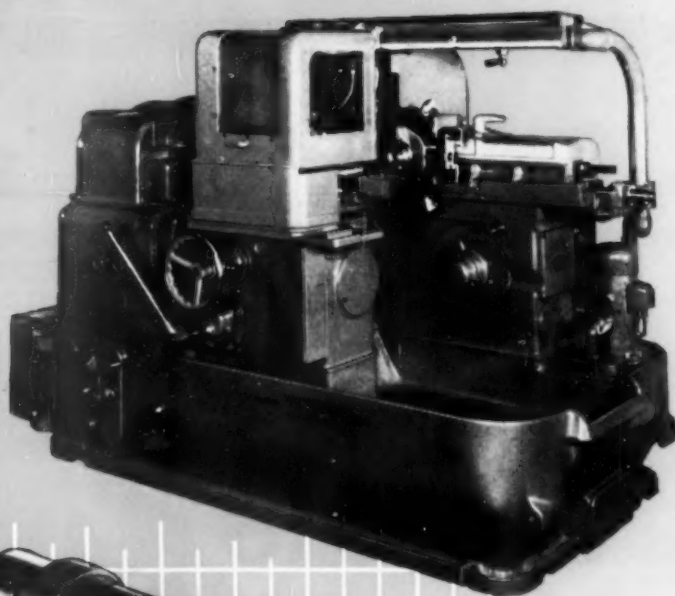
AUTOMATICS

... here's JUST ONE of the salient features of this machine which is made with SWISS PRECISION throughout:



**The ability to change
from BAR work to a
CHUCKING machine**

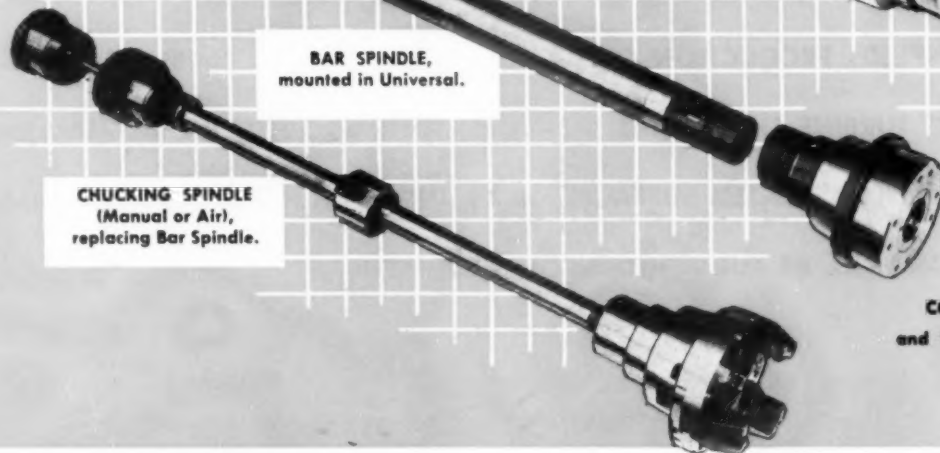
in 1 HOUR!



UNIVERSAL SPINDLE,
permanently in place.



BAR SPINDLE,
mounted in Universal.



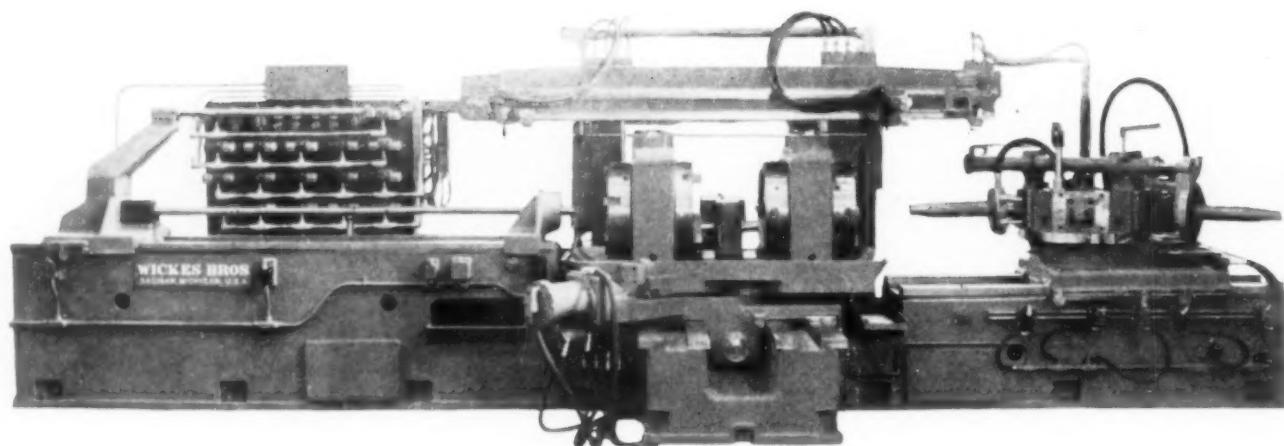
CHUCKING SPINDLE
(Manual or Air),
replacing Bar Spindle.

COMPLETE TOOLING
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WICKES fully automatic speeds production of jet



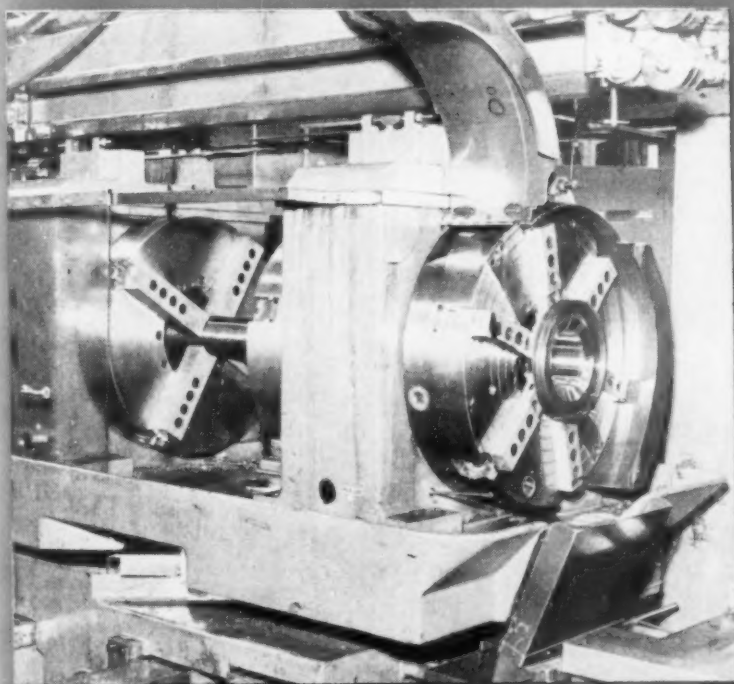
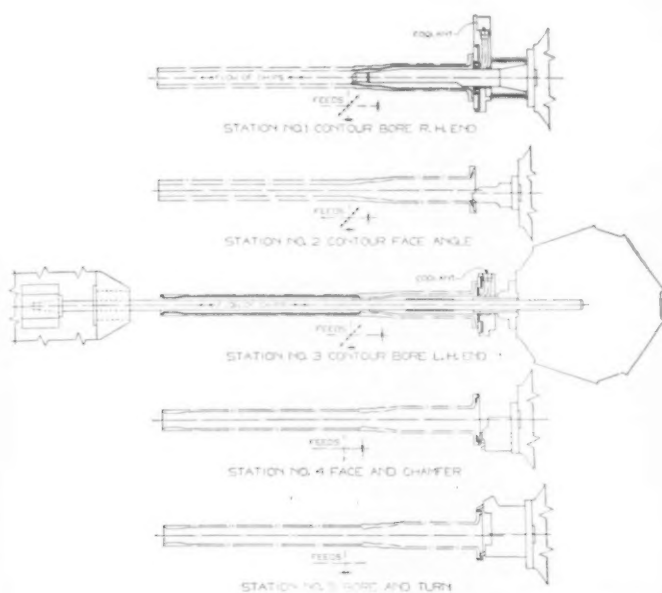
THE WICKES AUTOMATIC PROFILE BORING MACHINE REPLACES EIGHT MACHINES AND SPEEDS PRODUCTION OF JET TURBINE SHAFTS BY 700%. THE QUALITY OF JET TURBINE SHAFTS HAS BEEN GREATLY IMPROVED DUE TO MACHINING THE CLOSELY RELATED SURFACES IN A SINGLE CHUCKING. FURTHER INFORMATION WILL BE FURNISHED UPON REQUEST.

WICKES BROTHERS

DIVISION OF THE WICKES CORPORATION
SAGINAW, MICHIGAN

The Tool Engineer

profile boring machine turbine shafts 700%



SIX quick facts about the new Wickes profile boring machine

- All bores and both ends machined from single chucking.
- Chip disposal problems practically eliminated.
- Semi or fully automatic in cycle.
- Easily tooled for multiple operations.
- Boring bars supported at both ends whenever necessary.
- Improved quality due to increased accuracy and concentricity.

100 YEARS' EXPERIENCE IN
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WICKES BROTHERS
Saginaw, Michigan

DIVISION OF THE WICKES CORPORATION

*New and Higher Standards
Of Precision and Speed*

among jig boring machines

KNIGHT'S
Jigmaster

See It!

BOOTH 418



**compare these
specifications:**

Table Size	18" x 24"
Longitudinal Travel	20"
Cross Travel	14"
Vertical Capacity	23"
Throat	20"
Weight	7500 Lbs.



W. B. KNIGHT MACHINERY COMPANY

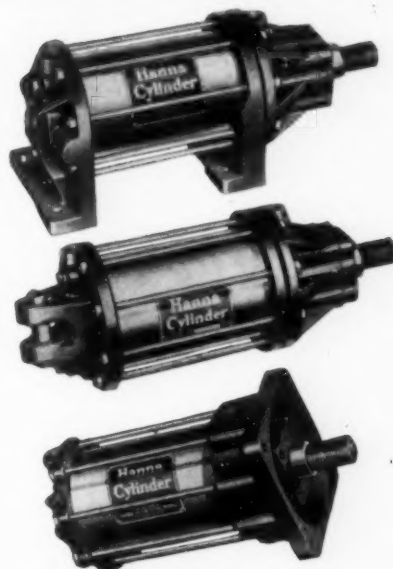
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HANNA AIR and HYDRAULIC CYLINDERS



Hanna T750 Fluid Power Cylinders

Air Operation to 250 psi, Hydraulic Operation to 750 psi
Write for Catalog 750A



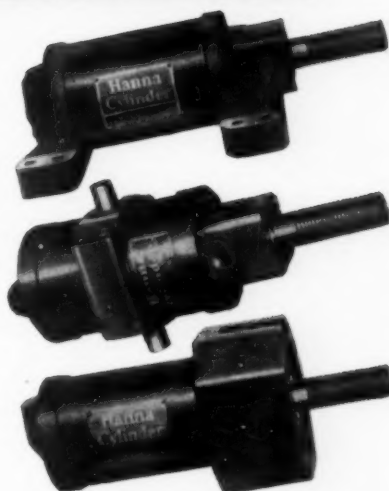
Hanna LP Cylinders

Air or Hydraulic Operation to 110 psi
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**Here's Everything You Need
Smoothly Dependable Power
Packaged As You Want It**

■ "Good things come in small packages," it is said . . . so do Hanna Cylinders . . . and in medium and large packages, too. From the complete Hanna Cylinder line, up to 1,500 psi capacities, you can select a standard size and mounting style, with the power and stroke you need, to exactly suit your applications. Of course, you will be sure it's the finest cylinder for the job—because it's a Hanna. Well over fifty years of design and manufacturing experience guarantee that.

So, when you need reliable cylinders for products you make for resale, or for use in your own plant, consult a Hanna representative, or call on our plant engineers to help you find the most efficient answer to your problem. Also write us for technical literature.



Hanna HP Cylinders

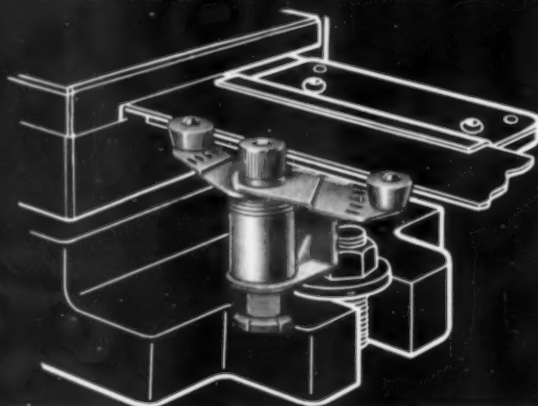
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Hanna Engineering Works

1768 Elston Avenue, Chicago 22, Illinois

NOW... A Low-Cost Stock Guide



NEW DAILY ROLLER STOCK GUIDES AND GUIDE RAILS

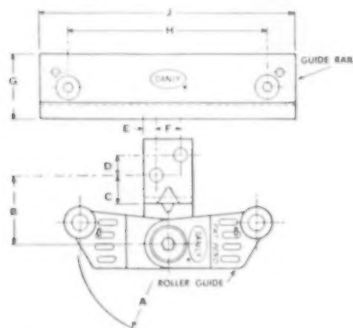
READY MADE—QUICK TO INSTALL

Versatile...for use on dies or in any operation where coil or strip stock must be guided.

Low-cost...the cost is only a fraction of the shop expense necessary to tailormake a guide.

Rugged...constructed entirely of steel. Rollers, arms, collar and bracket are hardened. Adjustable, three-coil music wire spring.

Roller Guide, Large.....\$4.50 each
Roller Guide, Small.....4.00 each
Guide Rail.....\$3.50 box of five (all one size)
(Discount for quantity orders)



Roller Guide Dimensions, Inches

	Cat. No.	A	B	C	D	E	F
Roller Guide Large	9-70-6	2 3/4	1 1/2	3/8	1/4	3/16	7/16
Roller Guide Small	9-60-6	1 7/8	1 1/8	3/16	3/16	3/16	3/8

Daily Roller Stock Guides packed one to a box unassembled, furnished with light or heavy-duty spring for optional use plus all necessary mounting screws and mounting instructions.

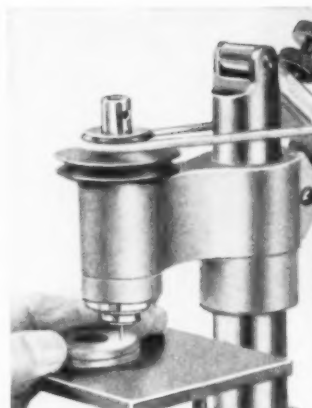
Guide Rail Dimensions, Inches

	Cat. No.	Max. Stock Thickness	G	H	J
Guide Rail	9-8025-6	.025	1	3 1/8	4
	9-8045-6	.045	1	3 1/8	4
	9-8080-6	.080	1	3 1/8	4
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Daily Guide Rails packed five of one size per box, furnished with mounting screws and dowel pins.

For immediate delivery, specify
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DAILY MACHINE SPECIALTIES, INC.
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SMALL DRILLS
MUST BE HELD
IN PRECISION COLLETS
TO ASSURE ACCURACY

LEVIN

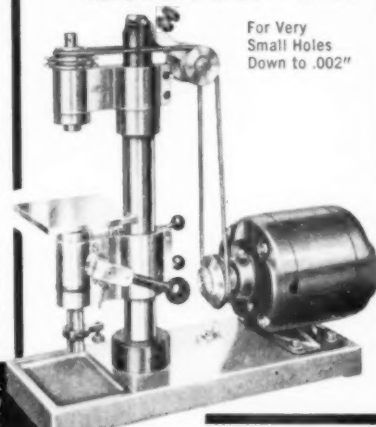
MICRO-DRILL PRESS

For Very
Small Holes
Down to .002"

Designed to hold small drills in precision collets, thus overcoming the difficulty of making a drill run true as when held in a conventional drill chuck. Absence of a sliding quill guarantees maximum sensitivity with fingertip control. A mounted 1/8" capacity chuck can also be used.

Send for Catalog "M" describing Micro-Drill Press, full range of collet sizes, Micro-Drills, accessories and other precision tools.

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Test Sets for
Machinists, Tool
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Exclusive lever action
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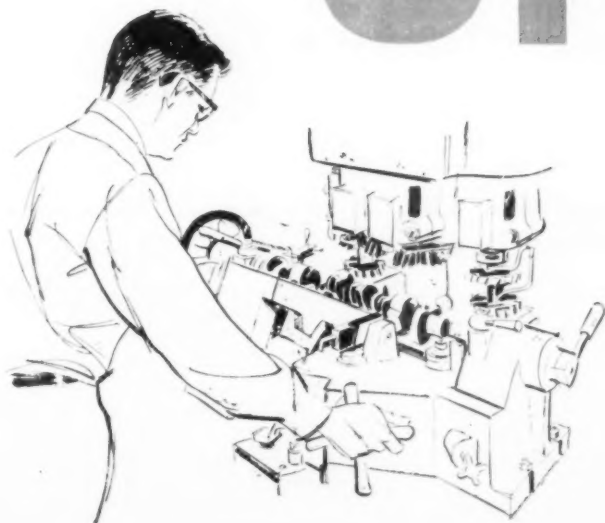
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See our Exhibit, Space 525, Prod. Eng. Show, Navy Pier, Chicago, Sept. 6-16
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INDUSTRY, IT'S

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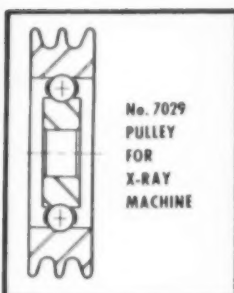
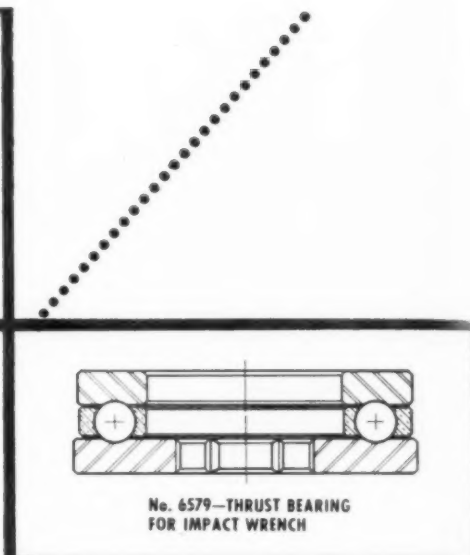
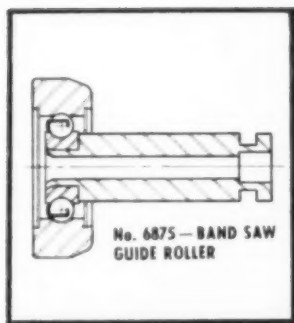
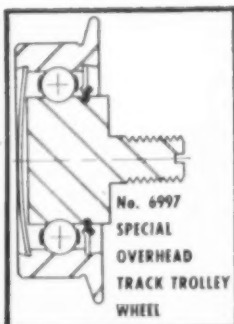
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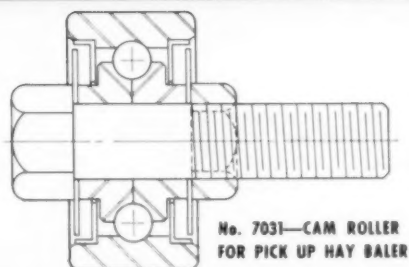
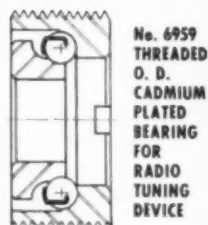
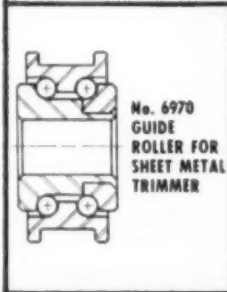
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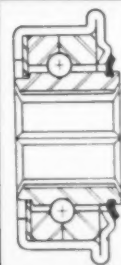
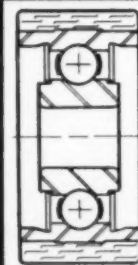


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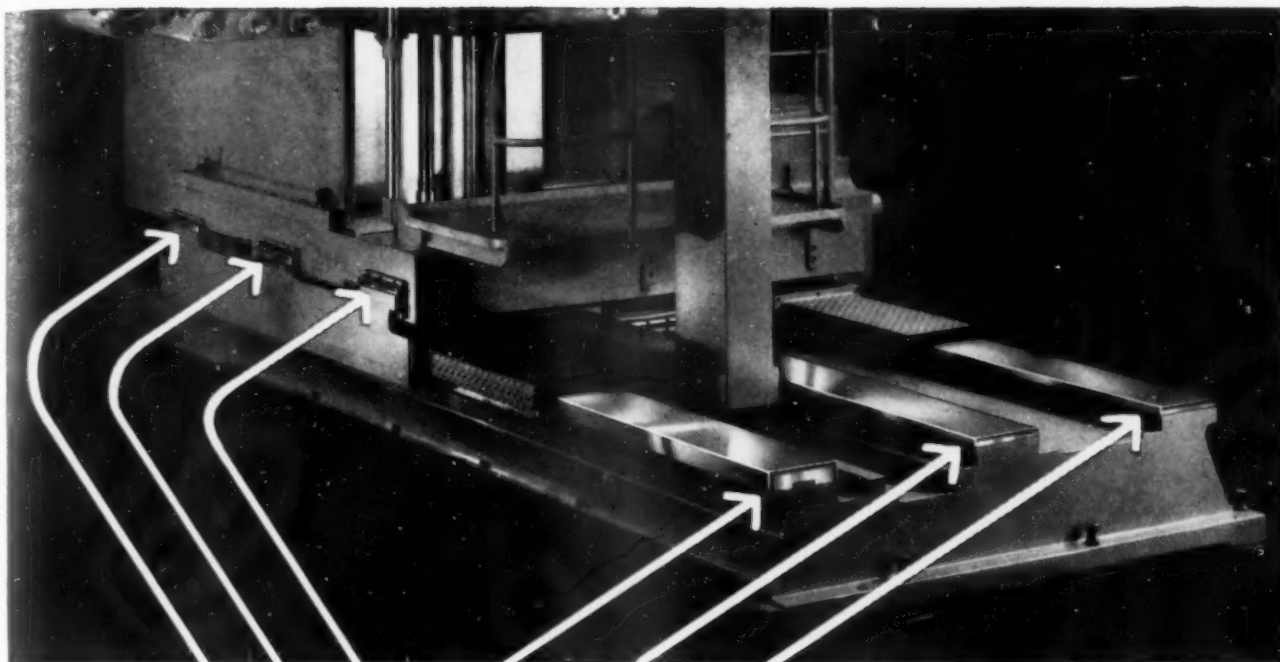


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NICETOWN • PHILADELPHIA • PENNSYLVANIA



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the G. A. GRAY CO. says **OK** hardened ways insure absolute accuracy during the long life of new 650 FC horizontal boring machine

THE G. A. GRAY CO., one of the world's most respected large machine tool builders, uses hardened and ground bedways and cross ways made by the Ohio Knife Co. In addition to insuring absolute accuracy during the long life of this machine, OK Hardened Bedways are the perfect mating surface for GRAY non-metallic bearing surfaces.

Specially heat-treated tool steel makes OK Ways practically wear-proof. Extreme hardness (65-66 Rockwell C) is uniform to a 3/16-inch depth or more. This is welded to a soft, tough steel backing under 2500 tons pressure, then precision ground to $\pm .0002$ inches. OK Hardened Ways are available in a variety of shapes and sizes or can be made to suit your requirements.

THE G. A. GRAY CO. is one of many Machine Tool Show Exhibitors using OK hardened products as components. Look for OK products on machines at the big Show. They are a good index to over-all machine quality.

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Slitter Knives • Shear Blades • Work-Rest Blades • Cut-Off Blades •
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THE OHIO KNIFE CO.

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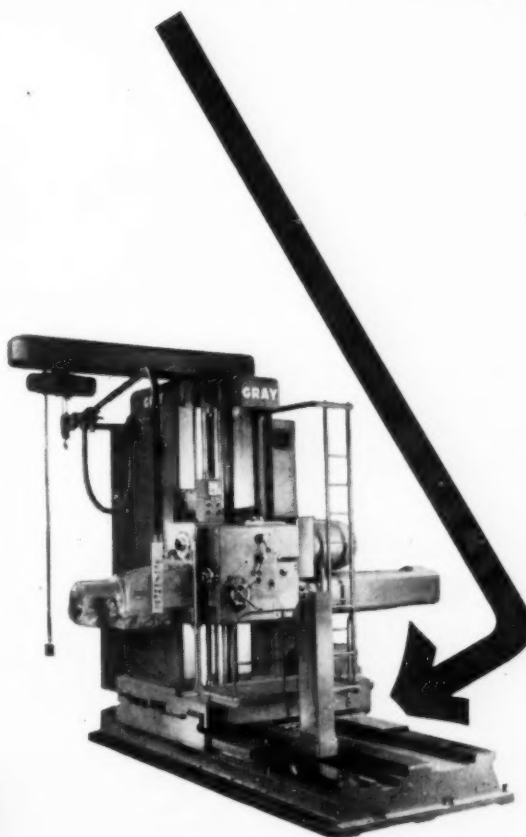
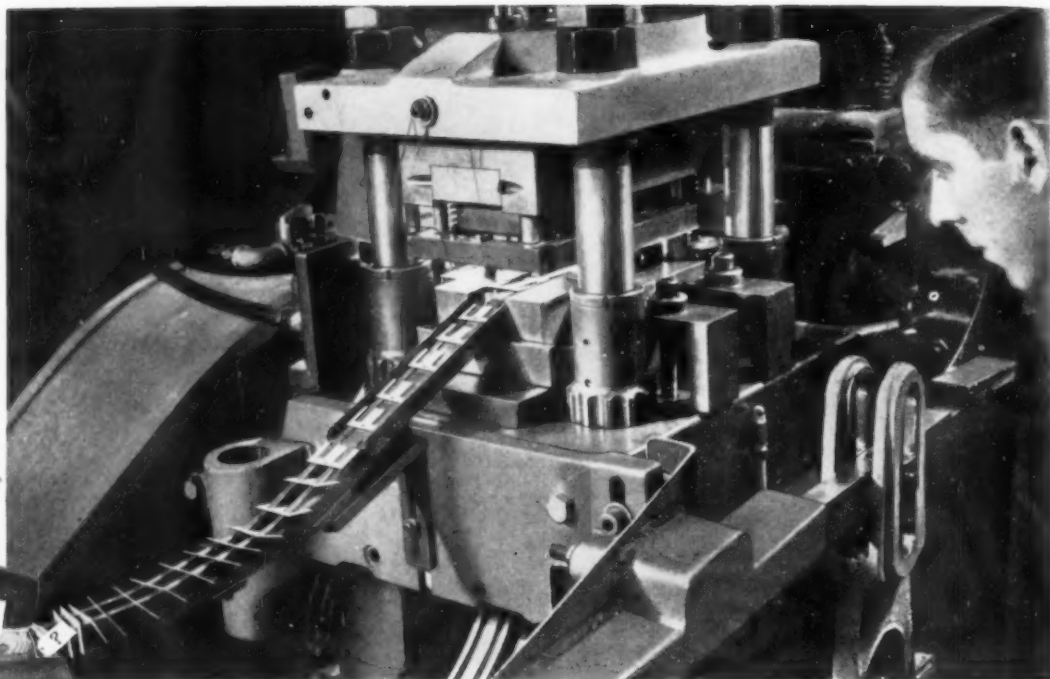


Photo courtesy Magnetic Metals Co. shows automatic production of power transformer laminations with DIE-CARB dies.



Mr. Tooley Says:

"There are two sides to every question"

CROMOVAN

HIGH CARBON—
HIGH CHROME STEEL

- Tougher edge
- Better edge wear
- Safe to heat treat
- Easier to machine

DIECARB

THE HIGH PRODUCTION CARBIDE

- Made expressly for blanking and lamination dies.
- High resistance to shock and abrasion.
- Low regrinding cost.
- Greater production per die life.

The question of which die material to use for blanking and laminating operations involves a choice of either *steel* or *carbide*. Consideration must be given to the factors which determine die life, such as abrasiveness of the material to be worked, burr limit, distortion of product or elimination of subsequent machining operations.

In the selection and purchasing of die materials, Firth Sterling offers you *unique* advantages because it manufactures *both* steel and carbide. From *one* dependable source of supply you are assured of completely *unbiased* recommendations and the *right* steel or carbide or *both* for every die making need.

Typically, Firth Sterling DIECARB and Firth Sterling CROMOVAN (die steel) are widely used for blanking and laminating operations, depending upon job requirements. Write today for literature and unbiased recommendations for your specific needs.

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R-310

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Zirconium

VELVETRACE
PRATT & WHITNEY
MILLING MACHINE

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PRATT & WHITNEY VELVETRACE (TRADEMARK) MILLING MACHINE

AN ENTIRELY NEW, UNIQUE TYPE OF TRACER CONTROL . . . follows the finest detail of any 3-dimensional model with extreme accuracy . . . but WITHOUT TOUCHING IT. Utilizes a short spark gap between tracer and model for control. Cannot damage any model, however soft or fragile, even when using the smallest diameter tracer. There is no mechanical motion in the tracer . . . and therefore no positional offset or time lag.

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Spindle, table and carriage are driven through new type, specially designed magnetic clutches which provide maximum sensitivity, continuously variable speed control, and eliminate backlash. Machine can be set to cut 3-dimensional shapes (including square walls) automatically with either table travel and carriage feed, or carriage travel and table-feed. Spindle quill "roll feeds" in precision preloaded ball bearings . . . assuring that original high accuracy and rigidity are maintained indefinitely.

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12" x 9"
SPINDLE SPEEDS
310 to 10,800 rpm



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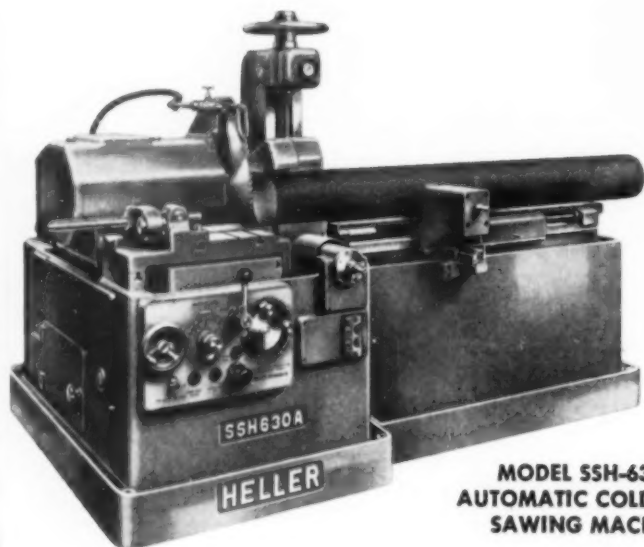
HELLER

SAWING OPERATIONS

WHEN YOU HAVE ALL THREE UNITS FROM ONE SOURCE



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MODEL SSH-630-A
AUTOMATIC COLD METAL
SAWING MACHINE

TRIPLE ECONOMY

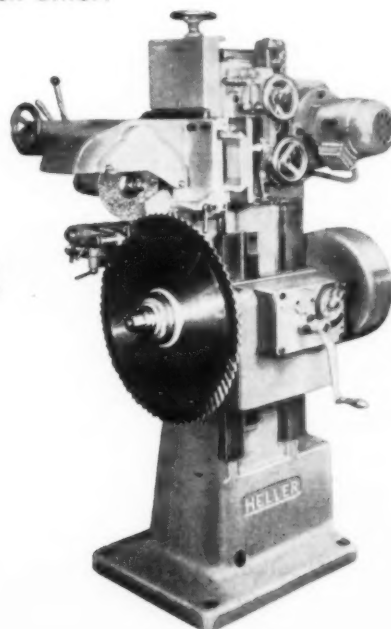
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1. The Cold Sawing Machine
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3. The Circular Sawblade

Economies are effected on every operation involved in cold metal sawing by taking advantage of the complete service available through Heller.

The specific savings offered by use of the combination of Heller Cold Metal Saws, Heller Blade Sharpeners and recommended Sawblades becomes accumulative when used with each other.

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AUTOMATIC SAW SHARPENING
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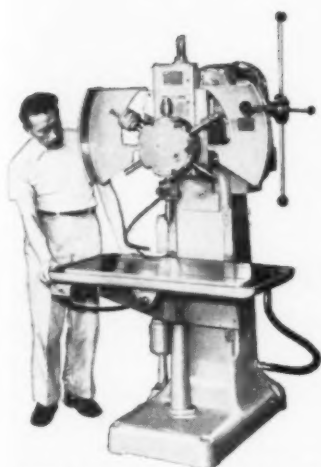


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WITH EXACTLY CORRECT BLADES.

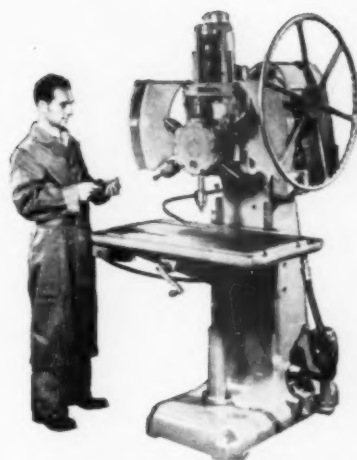
3 THE SAW BLADE

HELLER MACHINE COMPANY, 114 Liberty St., New York 6, N. Y.

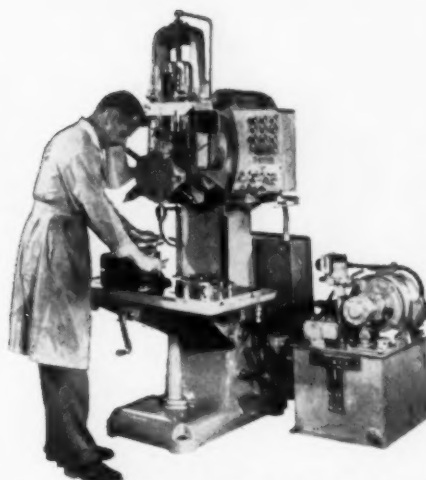
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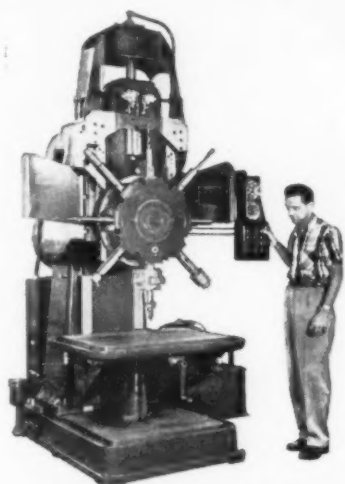
MODEL 2A—hand operated, 6-spindle



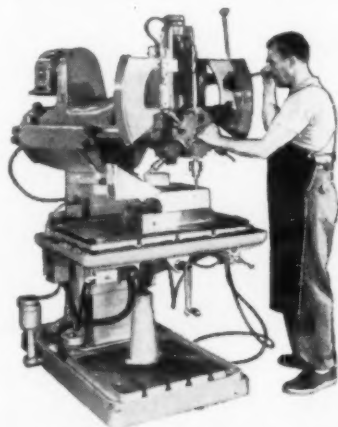
MODEL 2B—hand operated, 6-spindle



MODEL 2BH—automatic hydraulic, 6-spindle

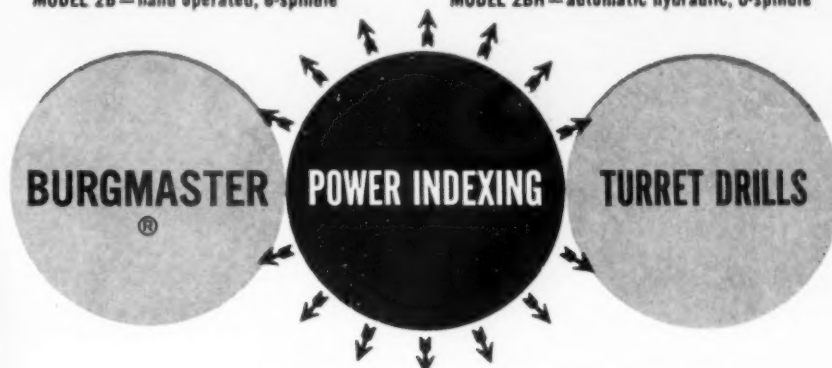
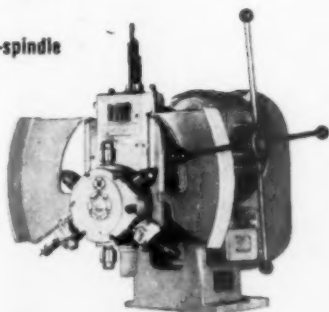


MODEL 3BH—automatic hydraulic, 8-spindle



MODEL 2BR—ram type radial, 6-spindle

MODEL NO. 2BF—
flanged mounting; can
be mounted in any
position for special
purpose set-ups



*Do the work of up to 8 machines
with only one operator*

The BURGMASER Turret Drill is designed to eliminate a large part of wasteful handling which research proves takes up as much as 50% of machining time. Here, in one highly versatile machine, drilling, reaming, counterboring, countersinking, spotfacing, tapping, O. D. threading and numerous other secondary operations can be accomplished by one operator. Ease of setup and operation makes the BURGMASER adaptable to very short as well as long runs of parts—a machine that will cut your second operation costs. We will be glad to send you specific information as to how this versatile machine can benefit your operations.

Automatic hydraulic BURGMASERS feature skip indexing, automatic cycling and infinitely variable pre-selective feeds. All models provide power indexing, pre-selective spindle speeds and very close pre-selective depth control. These features mean—faster production, more accurate parts, less maintenance—more profit for you.



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MANUFACTURING CO., INC.

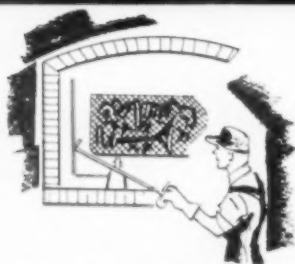
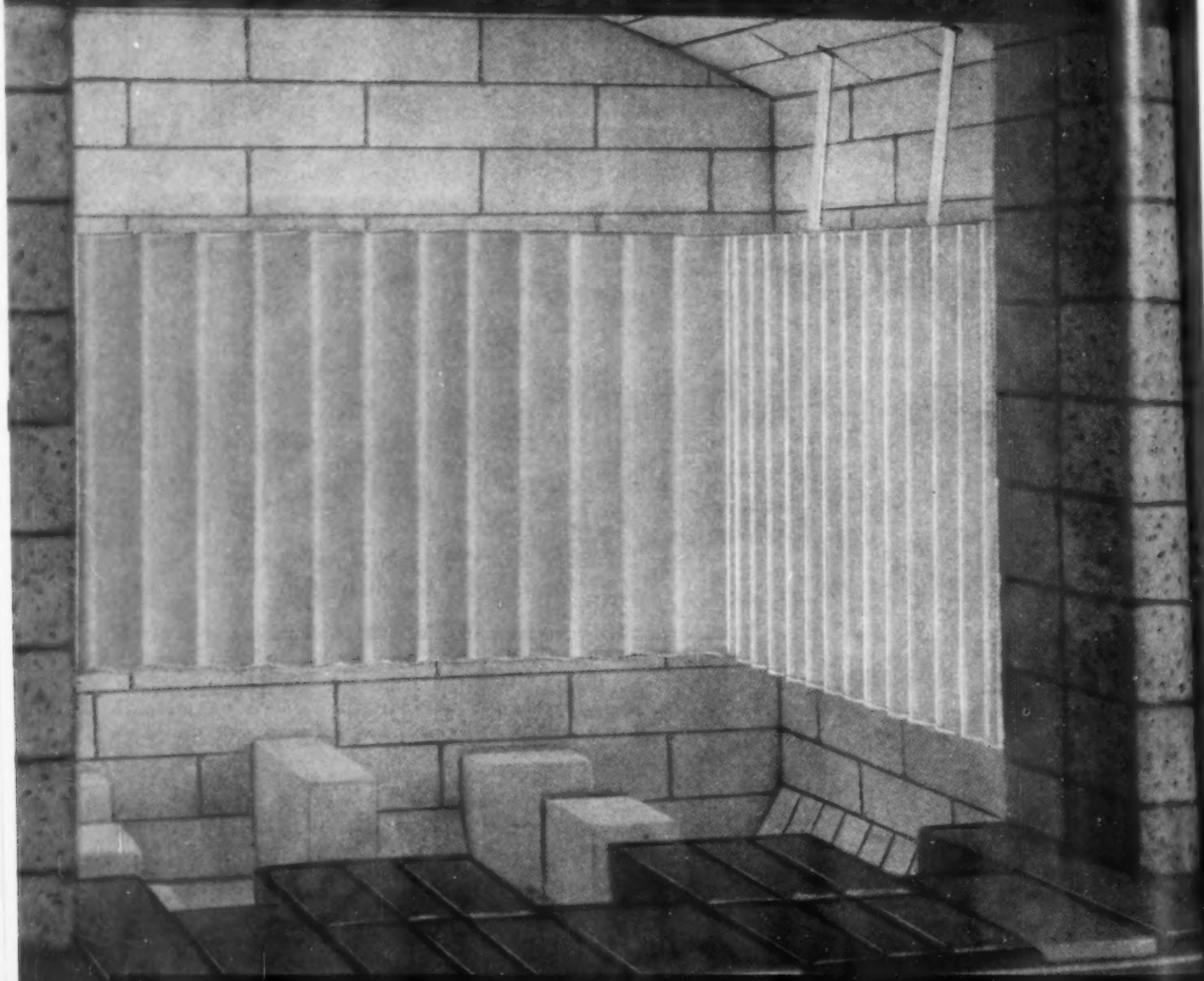
15001 S. Figueroa Street, Gardena, California



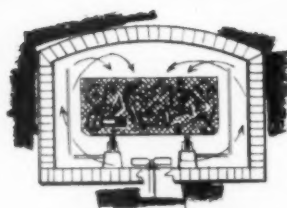
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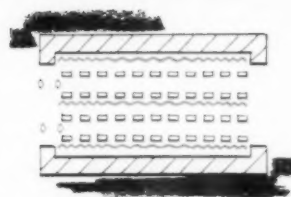
Chicago, Sept. 6-17



Safety! Extremely low voltage makes CORRATHERM elements completely safe. Let operator or work load bang it if they will. Neither element nor operator will be hurt.



CORRATHERM elements act as natural baffles to direct forced convection streams through the charge. The use of electric furnaces for carburizing and carbonitriding is now practical.



In continuous type furnaces CORRATHERM elements hang between lines of work as well as on side walls. Note how closer corrugations (at each end of element) compensate for incoming cold work and door losses.

NEVER BEFORE ANY ELECTRIC ELEMENT LIKE THIS NEW ONE BY LINDBERG

On the opposite page is a photograph of Lindberg's new CORRATHERM element for electric heat treating furnaces. You can see how radically advanced this element is over anything now used.

Wherever electricity is the preferable source of heat for metal treating the CORRATHERM element now makes its use practical, efficient and economical.

And this includes carburizing and carbonitriding furnaces, too! Problems created by the use of electricity in these types of furnaces are well known. CORRATHERM elements eliminate them completely. These facts tell you how and why:

LOW VOLTAGE: Operates at extremely low voltage. No leakage through carbon saturation. Around Lindberg we talk about it as the electric element "without any electricity...to speak of!"

ATMOSPHERE CIRCULATION: Elements act as baffles to direct circulation of convection streams.

SAFETY: Extremely low voltage also eliminates shock or short hazards.

DURABILITY: Watts density at all-time low. Element practically indestructible. Work load or operator's charging tool can't hurt it.

EASILY INSTALLED: Element is not enclosed, just hangs in furnace. No complicated mountings required.

CORRATHERM, Patent No. 2694740 (other patents pending), was developed in Lindberg laboratories, by Lindberg metallurgists and engineers. To find out just how its advantages can be applied to your heat treating processes get in touch with your Lindberg Field Representative. (See classified phone book.)

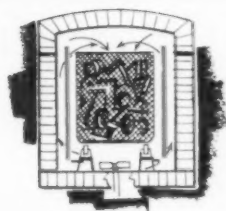
LINDBERG ENGINEERING COMPANY

2447 West Hubbard Street, Chicago 12, Illinois

Los Angeles Plant: 11937 Regentview Ave., at Downey, California



If you are in Chicago during the period of the three shows, September 6 to 16, plan on attending one of the special showings of this new element at our plant. Just phone MOnroe 6-3443 and we'll make the arrangements.

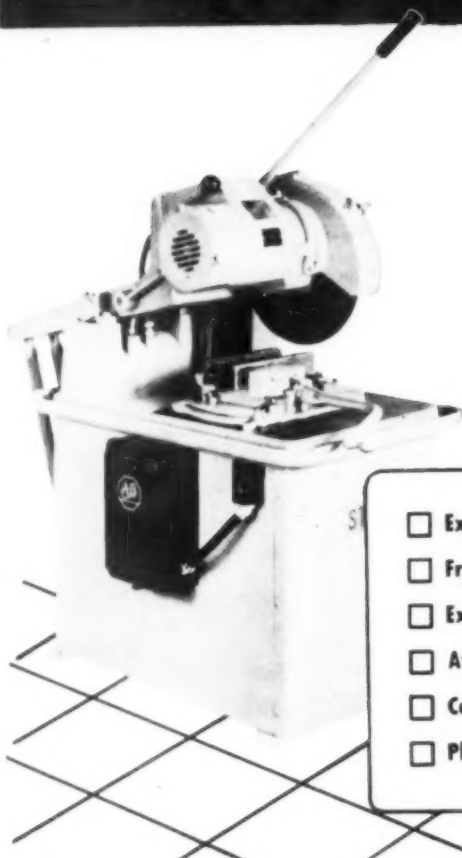


No retort needed in pit-type carburizing furnace with CORRATHERM elements. Again see how elements serve as baffles to direct forced convection stream through charge.

CORRATHERM

by LINDBERG

WHAT WERE YOUR CUT-OFF COSTS LAST YEAR?



- ☐ Extortionate
- ☐ Frightening
- ☐ Exorbitant
- ☐ Average
- ☐ Comfortable
- ☐ Pleasantly Low

Modern M75 by Stone Built to Reduce Costs ...because it's built to LAST!

Long, trouble-free service under the toughest conditions is assured by rigid construction of the M75. Modern engineering enables you to cut *faster*... average 2 to 4 seconds per sq. inch in ferrous, non-ferrous and non-metallic materials. Cut *cheaper*... increase your production by margins that add up to increased profits overall!

Machinery by Stone...a complete line...includes standard and exclusive features that will enable you to realize all the profit-potential on your particular operations.

Ask about the geared-in-head motor—an exclusive Stone feature—which delivers maximum power direct to the cutting edge for top efficiency. Our representative will gladly discuss your requirements with you. No obligation: simply write or phone.

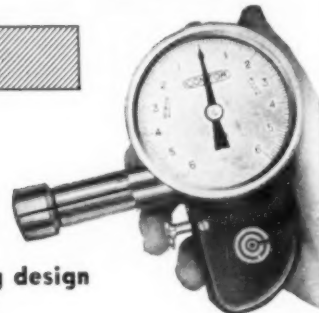
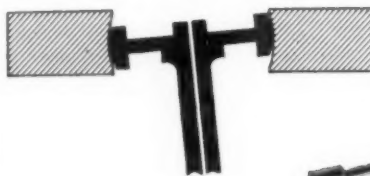
"Cut-off machinery by Stone...represented in every major industry throughout the world."

STONE MACHINERY COMPANY, INC.

11 FAYETTE ST., MANLIUS, N. Y.

USE READER SERVICE CARD; INDICATE A-9-384-1

Can be adapted to gage SPHERICAL BORES



A comparatively simple modification of standard Comtorplug design adapts it for this use. **STATE YOUR PROBLEM.**

COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from 1/8" to 8" dia.

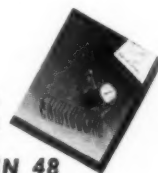
Unique Advantages

- Positive gaging accuracy to fraction of .0001" regardless of who operates it.
- Indicates actual size, a fixed—not passing—reading.
- Positive 2-point gaging—automatic centering.
- Shallow holes, deep holes, inside splines, open-end holes gaged easily.
- Detects ovality, back or front taper, bell mouth, barrel shape.
- Reaches to bottom of blind holes.
- Gages work while still held in chuck.
- A shop tool for all-day every day use.
- Portable—no wires, hoses or stands.

Investigate the gage used by the thousands in jet engine, automotive transmission, household appliance, farm machinery, guided missile and other volume-precision plants. **IT MAKES PRECISION GAGING EASY...** at machine... at inspection bench... for selective assembly. No other like it—investigate and see why.

COMTOR COMPANY

69 Farwell St.
WALTHAM 54,
MASS.



GET THE FACTS—REQUEST BULLETIN 48

USE READER SERVICE CARD; INDICATE A-9-384-2

INCREASE PRODUCTION.. SAVE TIME & MONEY ON YOUR DRILLING OPERATIONS



MEYCO

Carbide Inserted Bushings

last longer, cost less
in the long run

Here is a bushing that combines the best features of steel and carbide; the strength of steel and the long life of carbide. First cost: slightly higher than ordinary steel bushings; their life: many, many times as great. In addition to such obvious savings, MEYCO bushings increase the life of drills and reamers, produce accurate work for a longer period of time, save on machine-down time and on nonproductive man-hours.



Auto manufacturer says: "...the steel bushings previously used averaged about 28 hours life. MEYCO bushings ran 1,168 hours before they were unusable."

For information and prices write for Meyco Bushing Catalog No. 12

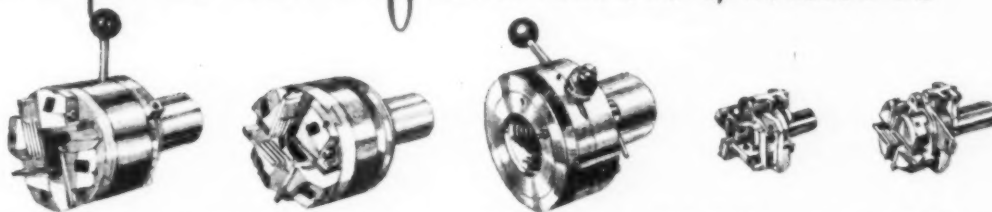


W. F. MEYER'S CO., INC., BEDFORD, INDIANA

USE READER SERVICE CARD; INDICATE A-9-384-3

The Tool Engineer

Jones & Lamson offers... a complete line of die heads & chasers



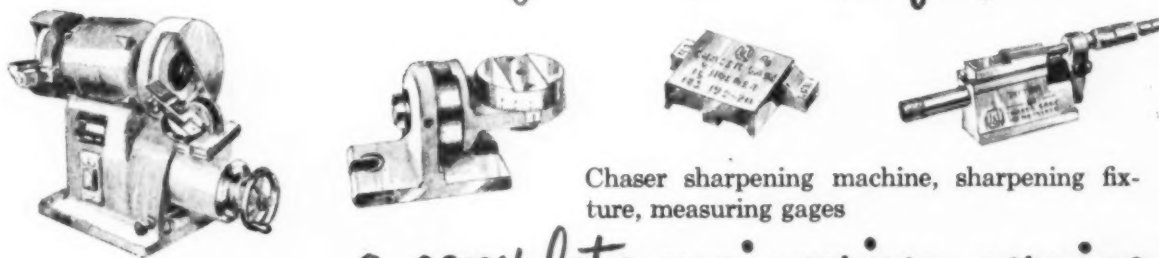
Automatic opening tangent stationary and revolving types, radial stationary type, B&S and small turret lathe types

a complete line of accessories



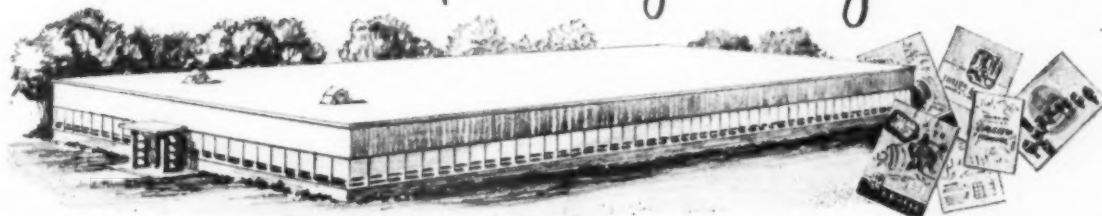
External and internal trip attachments; drill press adapter, floating holders

a complete line of sharpening equipment

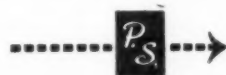


Chaser sharpening machine, sharpening fixture, measuring gages

a complete engineering service



World's newest, most modern thread tool plant. Complete literature for all J&L thread tool products



J&L Automatic Opening Die Heads and Chasers assure: low initial cost — ease of operation — controlled resharpener — use of carbide where applicable. Class III threads guaranteed. This means important savings regardless of your tolerance requirements. Write to Dept. 710 for complete information.

JONES & LAMSON

Machine Tool Craftsmen
Since 1835

JONES & LAMSON MACHINE CO., 518 Clinton St., Dept. 710, Springfield, Vt., U.S.A.



THREAD TOOL DIV.



The man who needs a new machine tool and doesn't buy it - is paying for it anyway...

**in
scrap
losses**

Age alone doesn't obsolete machines. There are other factors. Consider the closer tolerances of two- or three-tenths now being demanded on the production line. Many a machine tool installed only five years ago can't hold to these precision tolerances. Any attempt to do so results in high scrap losses.

Consider the design of the machine. Today there is less dependence on the skill of the operator. Less subjection to human inconsistency. The built-in controls on machines utilizing the latest processing techniques minimize the problem of rejected parts.

One process with which industry obtains precision-production is Microhoning. This low-velocity abrading technique, employing low speeds and removing stock over a wide area, produces parts to exact dimensional and geometric accuracy. Microhoning uses a self-aligning tool with self-sharpening abrasives. There are no chucks to wear out of alignment; no off-tolerance parts because of dull tools or abrasive wheels needing dressing.

Check your scrap losses. Then decide whether you can afford to keep machine tools that cannot produce to current precision-production standards. You may discover that the money your scrap is costing you would buy a new Microhoning machine.



PART:

Shaft, Converter Reactor

PROBLEM:

Flame hardening caused shaft to bow, resulting in a high scrap rate.

SOLUTION:

Microhoning — removed from .004" to .008" stock from the diameter, generated a straight, round bore and eliminated scrapping of parts.



MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH



MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVE., DETROIT 38, MICHIGAN

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
Boston Post Road
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MICROMATIC HONE CORP.
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19115 Detroit Road
Cleveland 16, Ohio

REPRESENTATIVES: Allied Northwest Machine Tool Corp., 1222 S.E. 7th Ave., Portland 14, Oregon • Mason Machine Tool Company, 415 So. Second East, Salt Lake City, Utah • Perline Machinery & Supply Co., 1921 First Ave. South, Seattle 4, Washington
REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

MICRO-PRECISION DIVISION • 2205 Lee Street, Evanston, Illinois

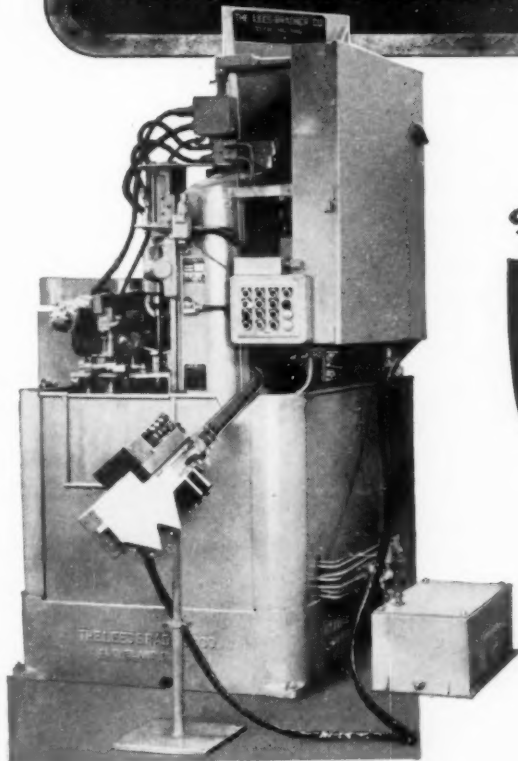
Hydraulic Controls • Diesel fuel injection equipment

GET THE **PITCH** ON ...

MACHINES THAT THINK FOR THEMSELVES

AUTOMOTION

ENGINEERED AND DESIGNED BY THE LEES-BRADNER CO. CLEVELAND 11, OHIO



TYPICAL PERFORMANCE DATA

- 3½" diameter, 3 start hob
- Runs at 200 RPM
- Feeds at .050" per revolution
- Hobs two pieces per load
- Hobs two gears every 4 minute.
- 47 teeth in gears
- Face width of gear ¾"
- Loading and unloading time 2 seconds

SEE IT IN ACTION AT

THE
MACHINE TOOL
SHOW

CHICAGO, ILL.
SEPT. 9-17, 1955

INTERNATIONAL AMPHITHEATRE

BOOTH 1212



Here is your chance to see Automotion in action . . . The amazing machine that seems to think for itself. Lees-Bradner presents the gear hobbing machine that electronically corrects tolerances while the machine is in operation.

The "Electronic Brain" checks the finished gears as they come from the hobber and makes corrections in pitch diameters or root fillets by shifting the hob between cycles.

This revolutionary hobber is the reason we say "get the pitch on Automotion". . . the ultimate in efficient, time-saving hobbing.

Don't forget—Booth 1212 at the Machine Tool Show. Or, contact your Lees-Bradner representative who has the "pitch" on Automotion.

LEES-BRADNER

CLEVELAND 11, OHIO • U.S.A.

Company

BAY STATE DIAMOND WHEELS



for ALL YOUR TOOL GRINDING NEEDS

BAY STATE's complete line of diamond wheels offers the *correct* shape and specification to meet your exacting tool grinding requirements.

For example, BAY STATE'S new "BA" resinoid bond in the flaring cup wheel illustrated provides:

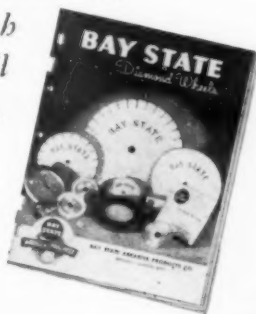
- Excellent corner holding qualities for grinding accuracy and maximum wheel life.
- Both dry and wet grinding from the same wheel.
- Ability to grind both carbide and steel where steel cannot be backed-off.
- High heat resistance to maintain bond strength, sharp, cool cutting, and top wheel efficiency.

This is one more illustration of better grinding engineered by BAY STATE in its outstanding "Wheels of Progress" program.



*Call on your local BAY STATE DISTRIBUTOR,
he's a key man on all grinding problems.*

*Ask him for the latest Diamond
Wheel Handbook which
includes net prices in all
bonds: Vitrified, Metal,
Resinoid.*



**BAY STATE ABRASIVE PRODUCTS CO.,
Westboro, Mass., U.S.A.**

Branch Offices and Warehouses — Bristol, Conn.;
Chicago, Ill.; Cleveland, Ohio; Detroit, Mich.; Pittsburgh, Pa.

Distributors — All principal cities

In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

Manufacturers of all types of Quality Abrasive Products



furane plastics inc.

Announces

2

EPOCAST 10

(CLEAR LAMINATING RESIN)

Epocast 10 is a fluid laminating resin which is used in conjunction with glass cloth to fabricate heat resistant plastic tools for polyester laminating molds and other type tools where superior heat resistance is a factor in a self-supporting structure. The service temperature limit when moderate physical stresses are imposed is 325°F.

EPOCAST 10A

(FILLED CASTING RESIN)

EPOCAST 10 A is a fairly viscous casting resin which is readily pourable after the addition of the hardener 10 A. It is used for making all types of cast plastic tools when it is desirable to cast upon a metal plate or metal core, rather than laminate a self-supporting structure. This material is of special interest in facing metal cores for making matched dies. The service temperature limit when moderate physical stresses are imposed is 400°F.

Heat Resistant

TOOLING PLASTICS

furane plastics

incorporated

4516 Brazil St. • Los Angeles 39, California

We will be glad to forward more complete information upon request.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-9-390-1

Better FOR TAPPING AND REAMING



In making set-ups for tapping and reaming you'll find the Ziegler Floating Tool Holder far superior to ordinary tool holders for two reasons.

First, it saves time because the set-up does not have to be so accurately made. Just align the work within 1/32" on the radius or 1/16" on the diameter and the tool holder does the rest.

Second, the Ziegler Holder naturally results in more perfect work because its automatic alignment feature eliminates the danger of errors due to the human element.

Try a Ziegler Holder on your next tapping or reaming job. You'll say it's tops!

PROMPT DELIVERY

W. M. ZIEGLER TOOL COMPANY
13574 AUBURN DETROIT 23, MICH.

Ziegler
ROLLER DRIVE
FLOATING HOLDER
for Taps and Reamers...

WRITE FOR
CATALOG

USE READER SERVICE CARD; INDICATE A-9-390-2

AIR-MITE

HIGH PRODUCTION AIR PRESS

with more Quality Features



- ★ Solid Steel Column. Greater strength and rigidity.
- ★ Brass cylinder, aluminum end castings, Hy-Car piston cups.
- ★ Accurately ground table.
- ★ Fast set-up and stroke adjustment.

You don't have to "baby" an AIR-MITE Press because they're ruggedly built to stand the gaff of production work. From the tip of their solid steel column to the heavy base, they're every inch a work-horse tool. Feature-for-feature, you can't buy a better, more economical operating press than an AIR-MITE.

Special adaptations available. Write us your needs.

1 Ton Capacity
\$8995
F.O.B. Chicago



New 3 Way Control Valve. For safer, more efficient press work, use AIR-MITE Control Valves. Connected in parallel and positioned on either side of an air press, they provide a safe, instantaneous press operating control. Operator must depress both handles to actuate press . . . keeps attention on work-piece, hands out of the way. For pressures up to 160 p.s.i.



AIR-MITE Devices, Inc.

4418 W. CARROLL AVENUE, CHICAGO 24, ILLINOIS

USE READER SERVICE CARD; INDICATE A-9-390-3

The Tool Engineer

"Standardize" on



LIVE CENTERS

**Get the LIVE CENTERS
You Need
- When You Need Them
- FROM STOCK**

See Your  Distributor!

Custom-Engineered Performance in Standard Models!

When you standardize on IDEAL Live Centers, you get *custom performance in standard models*. With IDEAL Live Centers you can meet practically any live center need *right from distributor stocks* — without delay or "special" ordering or engineering. This simplifies stocking, reduces inventory investment!

The IDEAL Live Center Line includes four separate models, in a range of sizes and tapers, to cover all common live center applications. They have been proven in hundreds and hundreds of plants where they are first choice for quantity and quality output.

Your IDEAL Distributor maintains an ample stock of IDEAL Live Centers to give you the centers you need when you need them. If you have particular problems he will suggest the live center that will do *your* job best.

Whenever you need live centers — see your dependable IDEAL Distributor — *first*.

***IDEAL Live Centers are also available in
Brown & Sharpe and Jarno tapers**

Sold Through Leading Distributors



IDEAL INDUSTRIES, Inc.
4152 Park Avenue, Sycamore, Illinois
In Canada: Irving Smith, Ltd., Montreal



MULTI-DUTY

Interchangeable male, female and pipe points for centered and uncentered work. Nine sizes; Morse tapers 1 through 5, as well as straight. Loads to 1500 lbs. at 100 RPM.



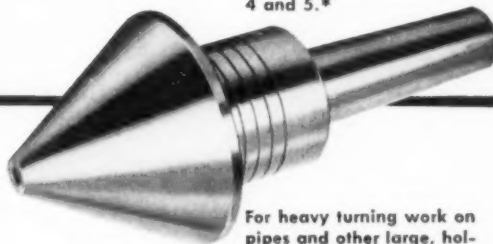
HEAVY DUTY

For your BIG jobs! For close tolerance turning on work up to 22,000 lbs. at 50 RPM. Eccentricity of less than .0002". Morse tapers 4, 5, 6 and 7.*



UNIVERSAL


Accurate to plus or minus .0001". Unusually high load capacity up to 5200 lbs. at 50 RPM means better work on a wider range of jobs. Morse tapers 2, 3, 4 and 5.*



**NEW
PIPE POINT
LIVE CENTER**

For heavy turning work on pipes and other large, hollow cylinders. Sizes range from 3" diam. to 7½" diam. Load capacities up to 22,000 lbs. Morse tapers 3, 4, 5, 6 and 7.*

The Complete Line of Live Centers
Get them from stock —
Get them from your IDEAL Distributor

IDEAL INDUSTRIES, Inc.
4152 Park Avenue, Sycamore, Illinois 
Please send free catalog data on IDEAL Live Centers.

Name _____
Company _____
Address _____
City _____ Zone _____ State _____

Talking About Die Sets



WITH
PHIL MARSILIUS
Vice-President
The Producto Machine Co.

Die Springs: Production Bonus or Bottleneck?

It all depends on how you, the user, select them and use them. Die springs fall into three general classifications according to type of wire used—square, oval and round. The type used in a die is determined in the original design and substitution is not easy once the die has been built, since inside and outside diameters, deflection and pressures vary widely among the three types. Great care, therefore, must be taken in the selection to see that the spring will withstand operating conditions. Should the original choice prove incorrect, re-machining of the die to accommodate a different spring type will prove expensive, to say nothing of the costly downtime involved.

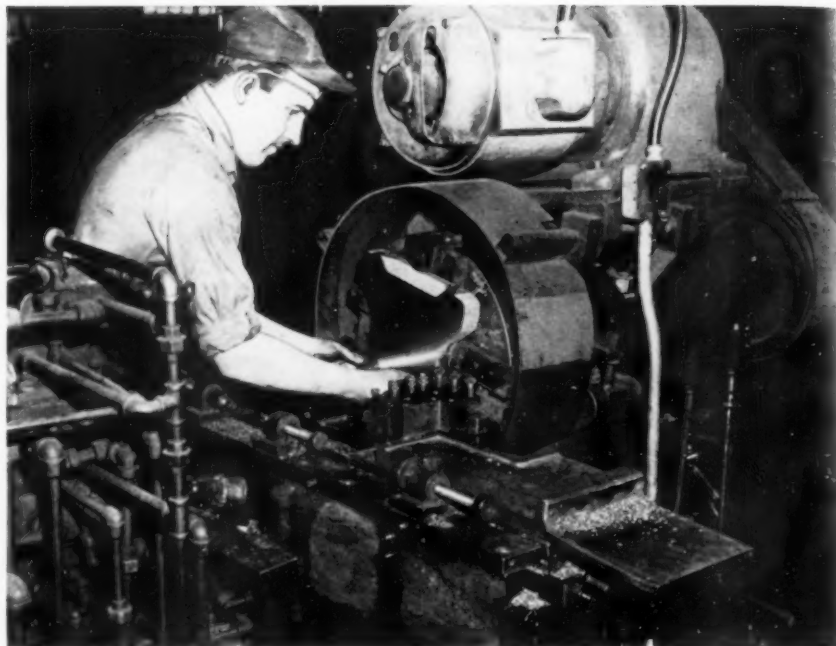
Types of Springs—Square wire springs are usually made from high carbon steel and used where a maximum load rate and a normal travel are required. They are best suited to short production runs since the forming operation for them and the square cross-section are more apt to result in failure when used for any great length of time.

Oval wire springs are available in three load ratings—30%, 37% and 50% deflection—and in two types of steel, high carbon and electric furnace chrome-vanadium. They are increasing in popularity because their design tends to eliminate failures resulting from structural strains and weak points. Carbon springs of this type are suitable for most applications and can be run for considerable time before failure. Chrome-vanadium springs, while slightly higher-priced, more or less guarantee performance for at least three times longer than carbon steel springs. When extreme economy is not a factor, best performance and reduced downtime are practically insured by use of chrome-vanadium.

Round wire springs are not generally suitable for die applications because of the difficulty of obtaining proper travel and load ratings for the standard sizes.

Hints on Proper Use—Even the best spring can fail if improperly used. Here are a few hints: 1. Springs should be sufficiently supported in a hole or over a rod or stripper bolt to guide the spring adequately under stress. Lack of support can result in crushing, twisting, binding or surface wear on even the best springs; 2. When altering spring lengths by cutting and grinding, care should be taken to prevent excess heat generation which causes spring to lose its temper; 3. For springs set in holes, squaring the bottom of the hole to give a flat seat is an added safeguard toward longer life; 4. Do not deflect springs beyond the recommended limits for the speed of operation.

To prevent die breakage and reduce downtime, your best protection is proper spring selection.



THIS SPECIAL LATHE PUTS PRECISION INTO YOUR DIE SET AT EVERY TURN

Putting precision into a Producto die set begins on semi-steel sets with the turning of the shank and top and bottom surfaces on Producto-built lathes like the one above. These high-speed production lathes are 100% automatic in function. A gang of cutting tools, preset for each die set size, automatically turns the shank to diameter and length and faces off the top of each punch holder. Next, a companion lathe a few feet away faces the bottom.

Pieces Finish-Ground

The operator loads and unloads the machine and, after checking the shank against standards, drops the piece onto a conveyor which carries

it down to the Blanchard grinders. There the bottom is ground for extra precision. Finally, the piece is checked for parallelism and thickness on highly accurate granite surface plates. Die beds go through a similar procedure. Rejects are rare.

Precision Machined In

Long experience in designing and building special machinery enables Producto to construct equipment that machines precision into its die sets at high speed. This mass-production technique, which almost eliminates human error, is another reason why you can depend on Producto for consistent accuracy in every die set. For precision die sets fast, call your nearest Producto branch.

THE PRODUCTO MACHINE COMPANY
930 Housatonic Avenue, Bridgeport 1, Connecticut
Telephone FOrest 7-8675

For prompt die set service, 'phone these PRODUCTO assembly warehouses:

Atlanta	CY 7667	Detroit	LI 6-7600	Philadelphia	MO 4-1010
Chicago	ES 8-3307	Kansas City	VI 1162	Rochester	GL 1810
Cleveland	SU 1-6158	Los Angeles	TR 9826	St. Louis	FR 3370
Dayton	MU 1651	New York	WO 4-7484	or check the Yellow Pages in	

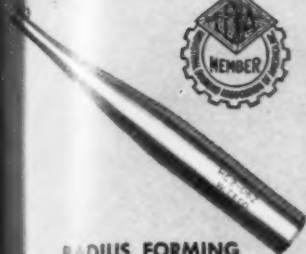
any stamping center in the United States or Canada for distributors stocking PRODUCTO.

Produce More With

PRODUCTO

Precision Die Sets

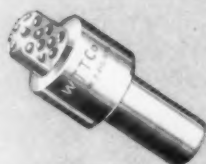




RADIUS FORMING TOOLS



"TRU-LINE" PROFILE DRESSING TOOLS



IMPREGNATED DRESSING TOOLS



STANDARD DRESSING TOOLS



"TRU-THREAD" THREAD DRESSING TOOLS



DIAMOND GRIT TOOLS FOR THREAD DRESSING



INDUSTRIAL DIAMONDS

1910 Our 45th Anniversary 1955



in the American tradition

Twice a day a quick transformation overtook the old frame garage on John R Street, Detroit. At seven in the morning, the doors swung open, a spindly car chugged out and the garage became a busy little workshop. Sometime after dark, the car was driven back in and, for a few hours, the workshop was a garage again.

As a workshop, it had for us a very special significance—it was here that our Company came into being and set up the first local shop devoted exclusively to making industrial diamond tools.

But, far more important, it was the first place in the whole mid-west where industry could find a complete stock of fine industrial diamonds, imported direct to Detroit, and superior to stocks previously available only in New York.

Such convenience is taken for granted nowadays and the mails deliver thousands of our diamond selections yearly, but, in those days, it was an innovation and so useful that in almost no time at all, the old frame garage (which had cost \$50.00) needed a 12-foot addition, (which cost another \$50.00).

And, that was but the beginning. Today, our plants are the most modern in the industry and in the intervening 45 years our laboratories have pioneered many of the most significant innovations in diamond tool technology, including *Engineered Diamond Tools*.*

Thus, in the good American tradition, a far-seeing idea, planted in the humblest beginnings, blossomed into a business that became national and international. And, this year, as we celebrate our 45th anniversary, we salute all of the many friends who helped to bring about this accomplishment.

**Engineered Diamond Tools are diamond tools engineered to the job and guaranteed to do it.*

WHEEL TRUEING TOOL COMPANY

74-3200 W. DAVISON AVE., DETROIT 38, MICHIGAN

ESTABLISHED 1910

Southwestern Plant: Dallas, Texas

Distributors in Principal U.S. Cities—Agents Throughout the World

WHEEL TRUEING TOOL COMPANY OF NEW JERSEY

33 West Street, Bloomfield, N. J.

WHEEL TRUEING TOOL COMPANY OF CALIFORNIA

5560 Alhambra Ave., Los Angeles 32, California

WHEEL TRUEING TOOL COMPANY OF CANADA, LTD.

575 Langlois Ave., Windsor, Ont.





first to offer

carbide bar stock cut to length

Now you can buy super hard Talide Bar Stock in bars, strips or rods; in standardized sizes from 1/16" square to 1/4" x 3/4" rectangular; tubes 1/16" to 3/8" O. D.; rods 1/16" to 1/2" diameter ... IN ANY LENGTH. Complete stocks are available at these warehouses:

Newark, N. J. 166 Bloomfield Ave.
Detroit, Mich. 20485 Van Dyke
Youngstown, O. 107 E. Indianola Ave.
Chicago, Ill. 4244 W. Diversey Ave.

● Metal Carbides produces only top quality metal in latest type vacuum furnaces. From ore to finished product, all operations are rigidly controlled in our new multi-million dollar plant of over 100,000 sq. ft. Write for Catalog 55-G. Metal Carbides Corporation, Youngstown 7, Ohio.

Only Metal Carbides Produces both Sintered and Hot Pressed Carbides

Talide TOOLTIPS

(TUNGSTEN CARBIDE)

1000, 2000, 3000, 4000,
5000 & 6000 STYLES

"H" & "P" STYLES








"RT" STYLE "RTT" STYLE




"STB" STRIPS ROD STOCK

KLAMP-LOK TOOLHOLDER INSERTS






"TR" "SC" "SQ" "DB"

Talide DIE INSERTS AND SPECIAL SHAPES

(TUNGSTEN CARBIDE)








Metal Carbides stocks 1325 different sizes of standard, solid Talide Metal in bars, strips, rods, tubes, bushings, rings, flats, tips and discs for immediate shipment. Special shapes furnished up to 25" O.D. in any length and up to 5000 lbs. per piece by weight —for every die and wear part application.



HOT PRESSED AND SINTERED CARBIDES · VACUUM METALS
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

*"Must see"
at*



*First
8 Wiedemann
Turret Punch Presses
producing short run
piercings in sheet metal
and plate*

**BOOTH 1420
WIEDEMANN
MACHINE CO.
4272 WISSAHICKON AVE., PHILA. 32, PA.**

- See the Wiedemann Method in Action
- Learn Why Wiedemann is Unmatched for High Speed, Low Cost Piercing in Low to Medium Production Quantities
- Discover How a Wiedemann Will Pay for Itself in Two Years or Less

Make Booth 1420 #1 on Your "Must See" List

CONFUSING ??

choosing a surface plate
of the right material can
be **CONFUSING** too!



SUMMARY OF COMPARISON TESTS

	Black* Diabase	Pink	Best Grey	Blue- White
Bulk Density	3.04	2.61	2.62	2.65
Wt. Per Cu. Ft.	190#	163#	164#	165#
Water absorption 48 hr. immersion	.11	.16	.20	—
Compressive strength lb./sq. in.	44,100	35,800	27,200	29,500
Surface Hardness Scleroscope eq. to Rockwell "C"	68 ave.	65 ave.	52 ave.	—
Resistance to abrasion	Class 1	1	2	2
Deflection Rating (bend under load)	25%	97%	123%	99%
Strength Rating (based on breaking strength)	219%	92%	92%	103%
Contains Mica	No	Yes	Yes	Yes
Color Acceptance, based on eyestrain on continual usage	Non-glare	Some glare	Some glare	Some glare
Resistance to Chipping Surface and Edges (based on Rumbling 2" cubes)	1	2	3	2

*As quarried by the French Creek Granite Co., St. Peters, Penna.

(Complete reports available on request.)

Of the many granite surface plates on the market today, made of pink, grey, blue-white and black granites, comparison tests, conducted by several independent testing bureaus, indicate Pennsylvania Black Diabase Granite superior to all other granites.

As you would specify a specific type of steel best suited to a particular job, you should also specify granite surface plates made of the material best suited for surface plate use.

Here is proof positive of the superiority of Pennsylvania Black Diabase Granite.

Lawley Black Granite Surface Plates, Angles, Straightedges,
and Layout Plates, made exclusively from this superior material,
Pennsylvania Black Diabase Granite, also offer you the
best in workmanship and surface accuracies.

For the finest in granite surface plates and other precision inspection
equipment be sure to specify—**LAWLEY**.

See our catalog in Sweet's Machine Tool File ⁹/_{L.A.}

Lawley

GRANITE SURFACE PLATE CO.

2000 WYOMING AVE.

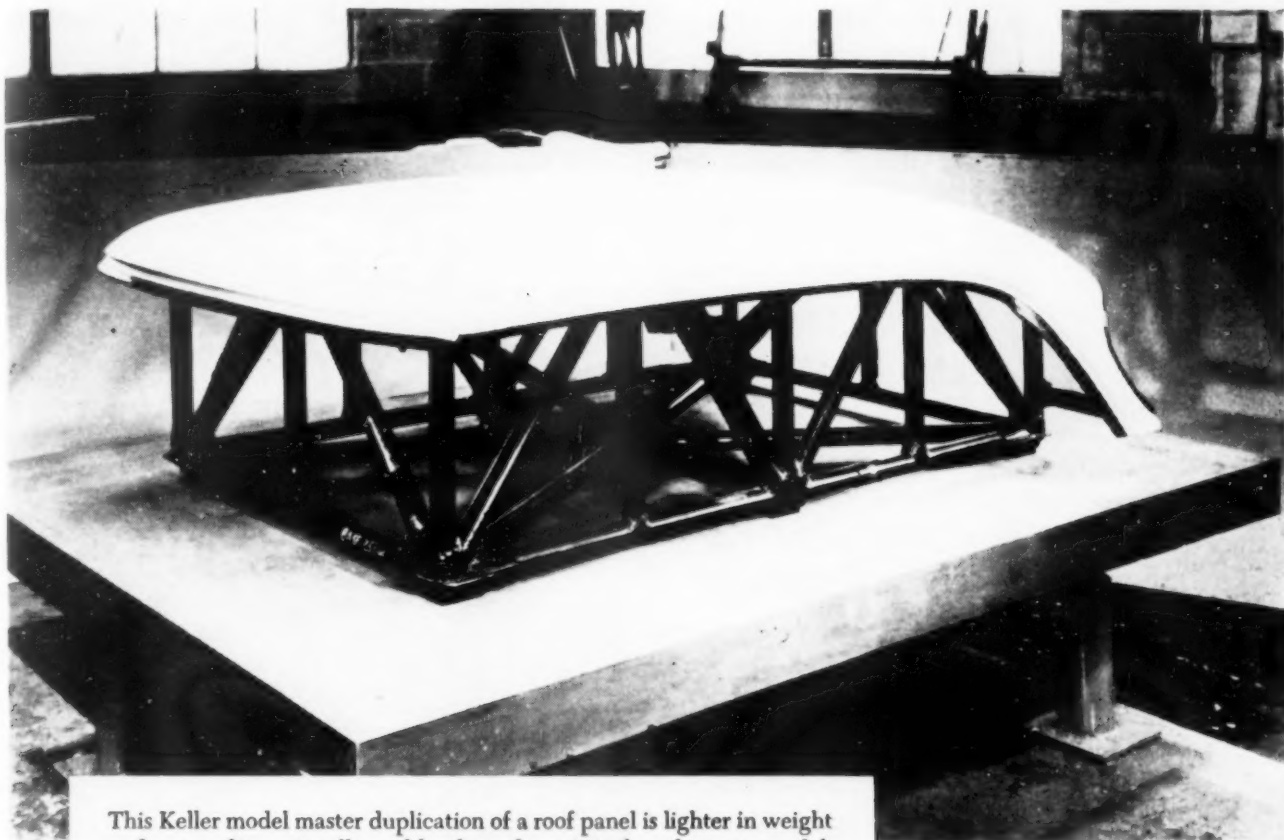
WYOMING, PENNSYLVANIA

Phone—Kingston Office: BUTLER 7-1562

Make tools faster, more dimensionally stable

WITH COMPOUNDS BASED ON **BAKELITE** EPOXY RESINS

TRADE-MARK



This Keller model master duplication of a roof panel is lighter in weight and more dimensionally stable than the original mahogany model. It's made from plastic tooling compounds based on **BAKELITE** Epoxy Resins and produced by **Ren-ite Plastics, Inc.**, Lansing 4, Mich.

Metalworking tools cost less when they're made with **BAKELITE** Brand Epoxy Resins. Compared with conventional materials, these compounds offer quick, easy production, plus these advantages:

- Liquid compounds—can be cast to shape without pressure
- Cured at room temperature—no applied heat
- Minimum shrinkage—minimum finishing
- Excellent flexural, compression, and impact strengths
- Outstanding dimensional stability
- Lighter weight that means easier handling
- Laminated with glass cloth to form jigs, spotting racks, fixtures and Keller models.

For more information, write Dept. JZ-181.



BAKELITE COMPANY, A Division of Union Carbide and Carbon Corporation **UCC** 30 East 42nd Street, New York 17, N. Y.
The term **BAKELITE** and the Trefoil Symbol are registered trade-marks of **UCC**.

Multiform

BIG BROTHER BENDER

Produces Without Special Tooling—Saves Die Costs Saves on Expensive Presses

Model BB



Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender using the standard tooling

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches—punching and blanking dies extra.

Will punch holes up to 1" and form material up to 3/4" thick by 4" wide. We also build smaller hand or air operated models for forming up to 1/2"x1 1/2" material.

These machines are solving new forming problems in many plants and could be the answer to yours.

Send for illustrated folder TE-5

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Kalamazoo, Michigan

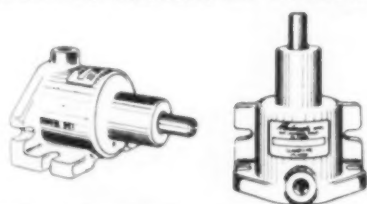
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Easiest to install or relocate!



UNIVERSAL MOUNTING for easy vertical or horizontal installation.

SLOTTED MOUNTING HOLES save installation, relocation time.

SPRING-RETURN TYPE CYLINDER operates from simple 3-way valve (MODERNAIR CRV or BV series recommended). Has 1/8" NPT port.

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Price (f.o.b. factory)

Bore Size	1" Stroke	2" Stroke
1 1/8"	\$ 8.51	\$ 9.41
2"	16.00	19.00
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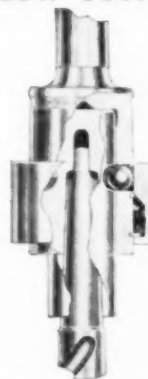
The New TITAN

"Presto"

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CHANGE
Chucks
and
Collets



For both VERTICAL and HORIZONTAL applications

Like magic!—JUST SIMPLY LIFT THE RING to insert or remove collets—without slowing the spindle R.P.M. This simple operation is especially designed for both vertical and horizontal drilling and tapping applications.

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COMPONENTS

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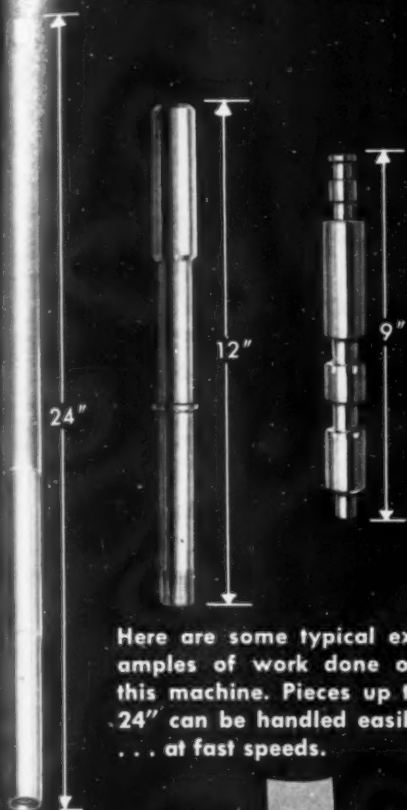
at the Machine Tool Show...Booth 1221

SEE THE GREENLEE SIX-SPINDLE BAR

AIR-FEED AUTOMATIC

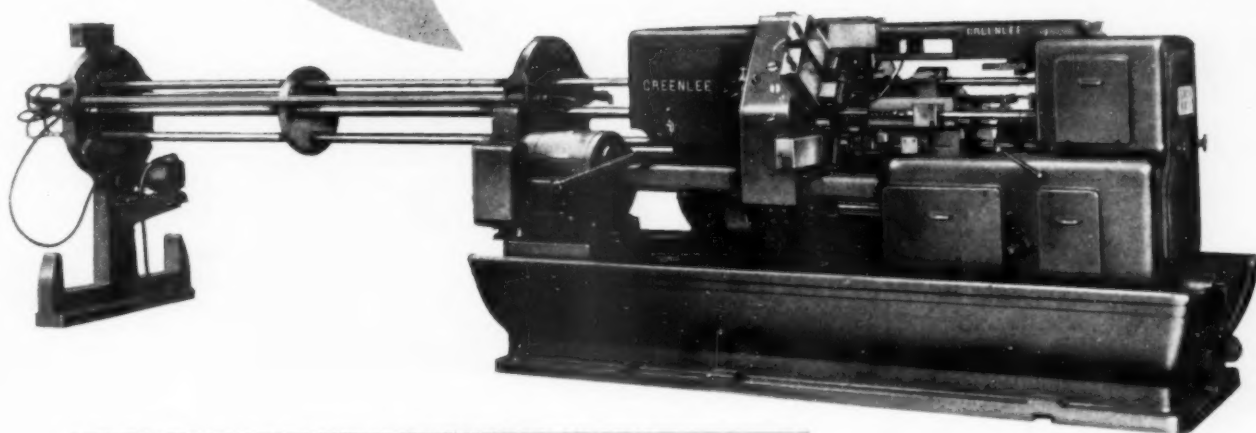
OPERATING WITH

**Air-Feed Stock Reel . . .
Lead Screw Threading . . .
Thread Rolling . . .
and a complement of standard
tooling attachments.**



Here are some typical examples of work done on this machine. Pieces up to 24" can be handled easily . . . at fast speeds.

The air-feed machine can be modified to handle long parts as shown at left.



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Rockford, Illinois

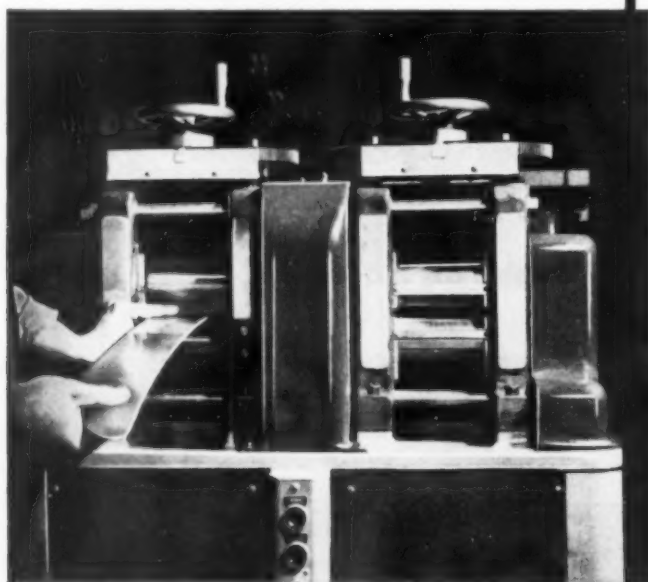
WRITE FOR
COMPLETE INFORMATION

The MEEHANITE Casting Reporter



3 PROBLEMS SOLVED IN STANAT MILLS

The Stanat Manufacturing Company, Long Island City, New York, produce a line of small rolling mills used in both laboratory and industrial production. Three fundamental problems in the design and manufacture of these mills were encountered and solved as follows:



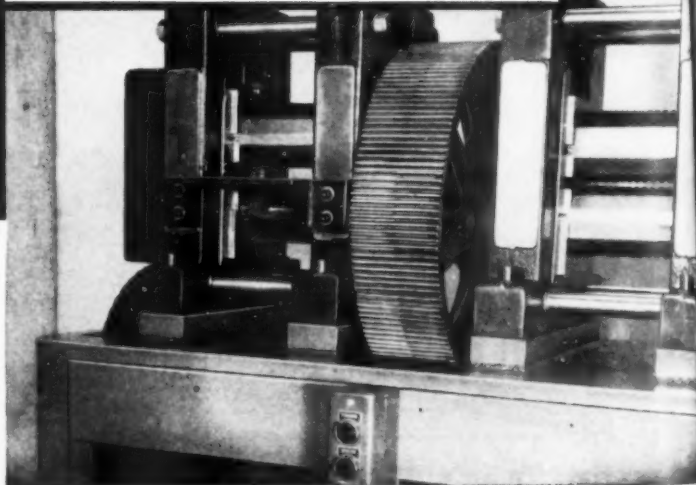
↑ Stanat three-inch combination mill assembled for rolling both flat and wire stock.

Heat treated Meehanite bull gears eliminated breakage in service. →

BUILDER SAYS:

"Generally, we use Meehanite castings for parts subject to high stress, heavy shock loading or where we desire dimensional stability during machining. Also, we use special heat treatable types of Meehanite metal in applications such as gears, and for rolls used in our mills

PROBLEM	SOLUTION
1. Subjection of frames to unpredictable stresses and shock in service.	Strong, tough, rigid Meehanite frames.
2. Roll leveler—a unit for leveling strip stock up to $\frac{3}{16}$ " thick. Wide speed ranges and changing types of material impose intermittent shock loads.	Pressure lubrication achieved by rifle drilling Meehanite frames. Meehanite housings for pinch roll bearings for long life and soundness.
3. Bull gear breakage—an unexpected application by customer resulted in gear breakage.	Bull gear redesigned to use heat treated Meehanite castings. No further breakage.



for hot rolling.

The use of the Meehanite castings gives us greater design freedom, makes for more compact sizes and gives a product that we know will stand up to anything that can be reasonably be asked of a mill."

WHAT MEEHANITE CASTINGS HAVE DONE FOR THEM

MEEHANITE GEARS

REPLACE FORGED STEEL IN COTTON GIN DRIVES

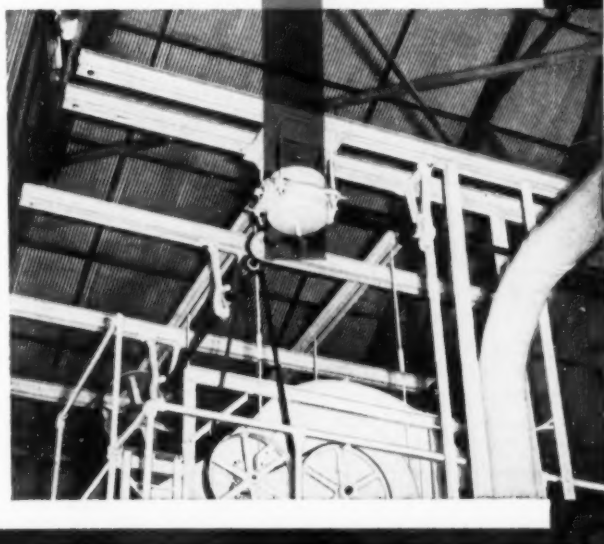
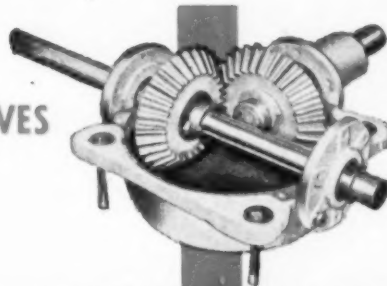
The Lummus Cotton Gin Company, Columbus, Georgia, achieved major machining and material economies by specifying Meehanite gear blanks when manufacturing the drive mechanism shown.

Formerly cut from a solid forged steel billet, re-design, after a study of the engineering properties available in Meehanite metal, developed a gear blank from which the drive gears were machined.

The unit as indicated, is a drive for a tramper countershaft on a cotton gin and operates not only the tramper, but in some cases, hydraulic pumps for the presses and is driven by a 30 HP motor.

BUILDER SAYS:

"We thus achieved not only a substantial saving in machining time and material, but operational noise was reduced because of the high vibration damping quality of the Meehanite gears."



ONLY A MEEHANITE FOUNDRY CAN MAKE MEEHANITE CASTINGS

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Atlas Foundry Co.	Detroit, Michigan
Banner Iron Works	St. Louis, Missouri
Barnett Foundry & Machine Co.	Irrington and Dover, New Jersey
Blackmer Pump Company	Grand Rapids, Michigan
Compton Foundry	Compton, Calif.
Continental Gin Co.	Birmingham, Alabama
The Cooper-Bessemer Corp.	Mt. Vernon, Ohio & Grove City, Pa.
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They are accordion-like, tubular rubber products that have a versatility and an adaptability impossible to duplicate in connections made by conventional methods. Produced by United States Rubber Company, they are made of natural or synthetic rubbers—with or without cotton, asbestos, glass or nylon fabrics. With few exceptions, all U. S. Multi-Flex products are made to order for specific applications.

MULTI-FLEX PRODUCTS ARE CIRCUMFERENTIALLY CORRUGATED !

This gives flexibility, rigidity, and the ability to take movements in axial extension and compression. Other qualities are:

- Resistance to crushing and fatigue
- Resistance to extremes of temperatures, abrasives, corrosives, oil, water, and grease
- High travel ratio.

WHAT ARE SOME EXAMPLES OF MULTI-FLEX PRODUCTS ?



Above are shown only six of the various styles of U. S. Multi-Flex boots. Because Multi-Flex boots are custom-made, **THEY CAN BE "TAILORED" TO MEET THE EXTENSION, COMPRESSION AND DESIGN REQUIREMENTS OF ALMOST ANY APPLICATION.**

WIDE APPLICATION !

In industry: Multi-Flex boots are used for rams in hydraulic presses making grinding wheels or other abrasive materials; on adjusting screws in grinders and machine tools; for guide rods in mechanical stamping presses; for reciprocating parts and for pistons and worm gears in a multitude of applications; for any hydraulic cylinders and other reciprocating parts requiring protection.

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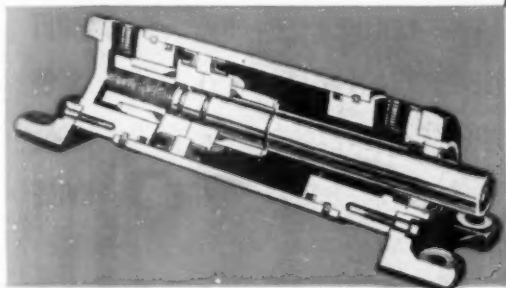
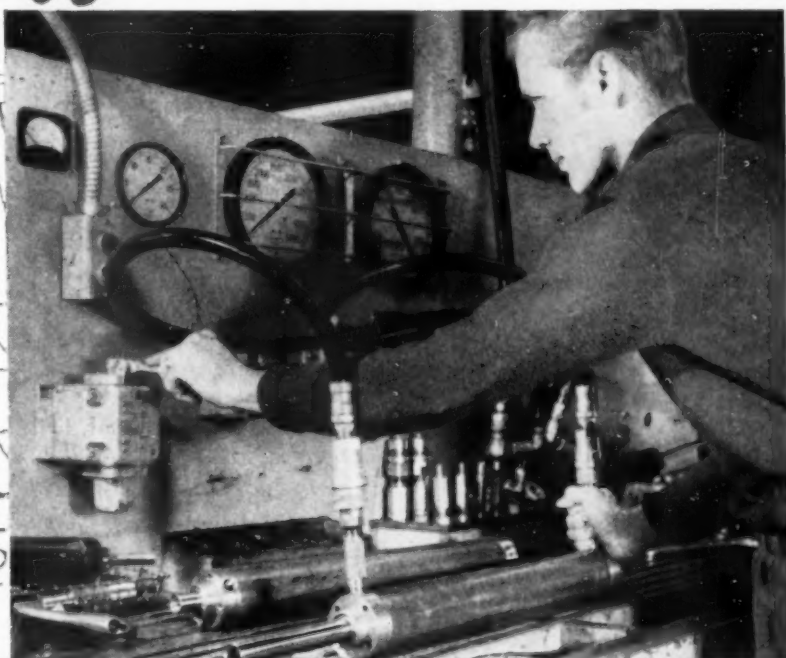
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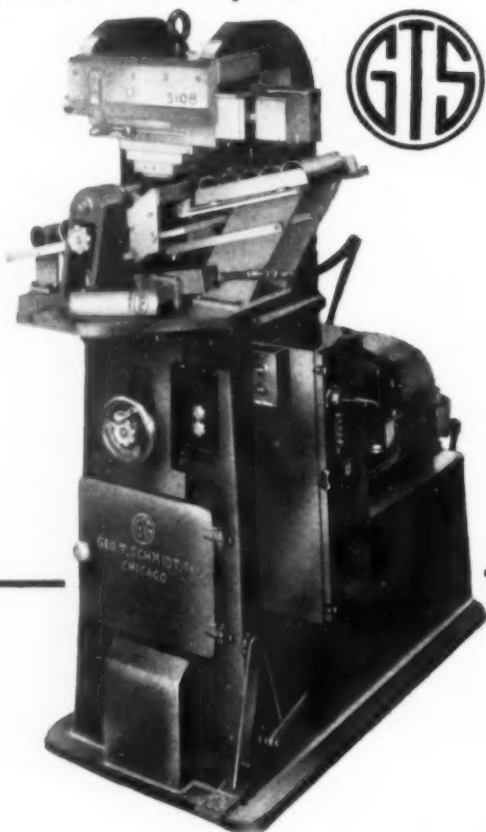
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MARKING METHODS

Mean faster, more uniform, less expensive identification of products and parts...



This high-speed, fully automatic tube marker is typical of GTS-designed production marking machines. It rolls a trade mark and part number on mild steel thin-walled tubes—2500 to 3000 of them per hour—making all impressions clean, accurate, and exactly uniform. It speeds production and cuts costs for a major automotive manufacturer.

This machine, or another unit of the extensive GTS line of Production Marking Machines, can reduce cost and increase production in your marking operations, too. To find out how—at no obligation—write today for an appointment with a GTS Sales Engineer.

**IF IT'S WORTH MAKING,
IT'S WORTH MARKING.**

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Slide Rods
Anchored at
1/2 Cost of
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for Drive Fits.

HERE'S HOW:

Grooved slide rods were inserted in cored, oversize holes and aligned in a holding fixture. Cerromatrix was melted and poured in place. When frozen, Cerromatrix expanded to give a tight fit that exceeded the life of the machine. Proven by 20 years in service.

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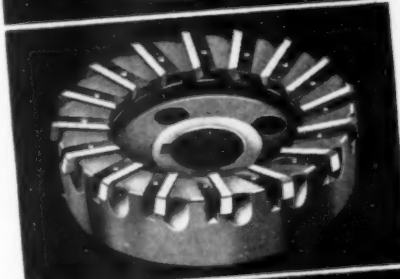
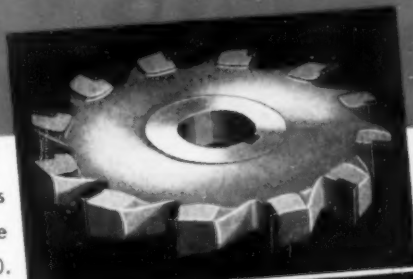
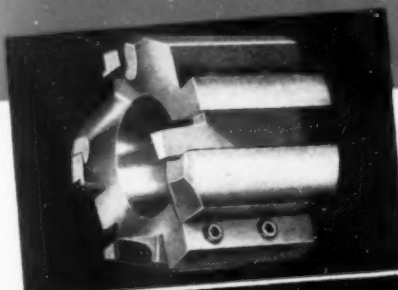
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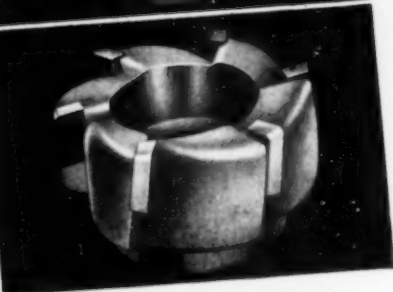
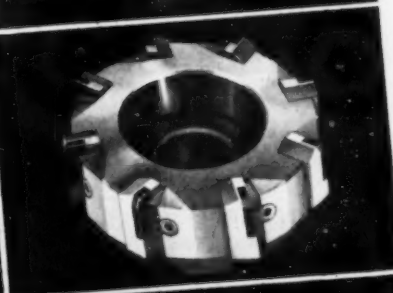
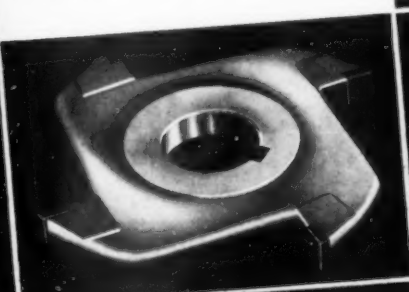
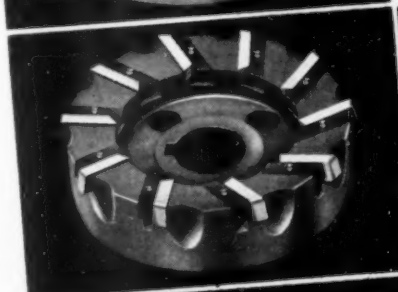
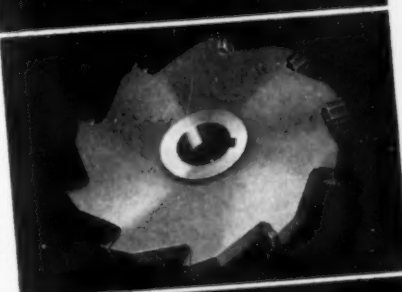
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High speed production grinding has made just *coolants* obsolete! Today's water-mix grinding fluid must provide lubrication, heat dissipation qualities, anti-rust protection and balanced surface tension. If you're using "*just a coolant*," it's costing you extra money!

Stuart's CODOL is a carefully designed liquid grinding compound that is *far more than just a coolant*. CODOL has been scientifically compounded to

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CODOL's carefully balanced surface tension insures the carrying away of chips and abrasive particles from the wheel, work and machine. Surface finish is improved, production is increased and good wheel life is obtained.

To be sure that you consider *all* of the important points, such as ease of mixing, resistance to rancidity, gumming and foaming, when selecting a water-mix grinding fluid, ask "the Man in the Barrel," your Stuart Representative, to call and help you. And write today for your copy of the Stuart Water-Mix Cutting and Grinding Fluid book.

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More than a "Coolant" is Needed

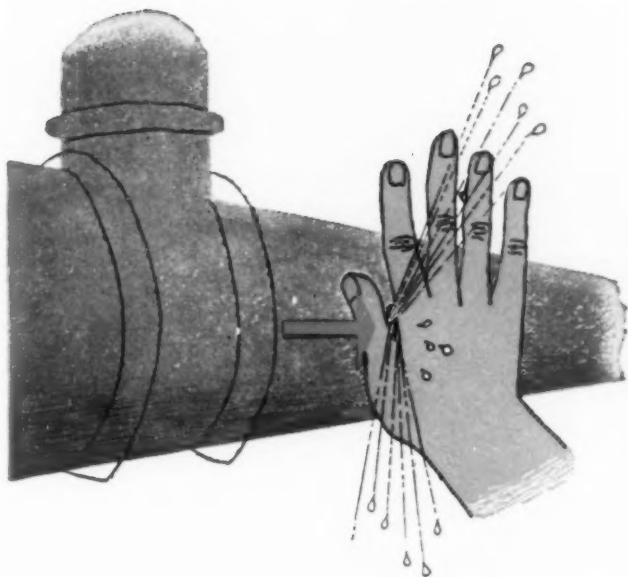
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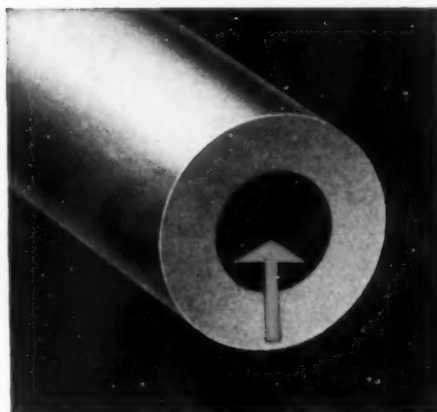


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Time Tested Cutting Fluids and Lubricants



a hole here means trouble...



a hole here saves trouble

Crucible Hollow Tool Steel Bars are a great trouble-saver for the metalworking industry. For they eliminate costly, time-consuming drilling, boring, cutting-off or rough-facing operations. And you save production time, machine capacity, and avoid scrap losses . . . for the hole is already in the steel you buy.

Crucible Hollow Tool Steel Bars are now available in any of our famous tool steel grades . . . in almost any combination of O.D. and I.D. sizes. And you get *immediate* delivery of five popular grades — KETOS oil-hardening, SANDERSON water-hardening, AIRDI 150 high-carbon high-chromium, AIRKOOL air-hardening, and NU DIE V hot-work tool steels.

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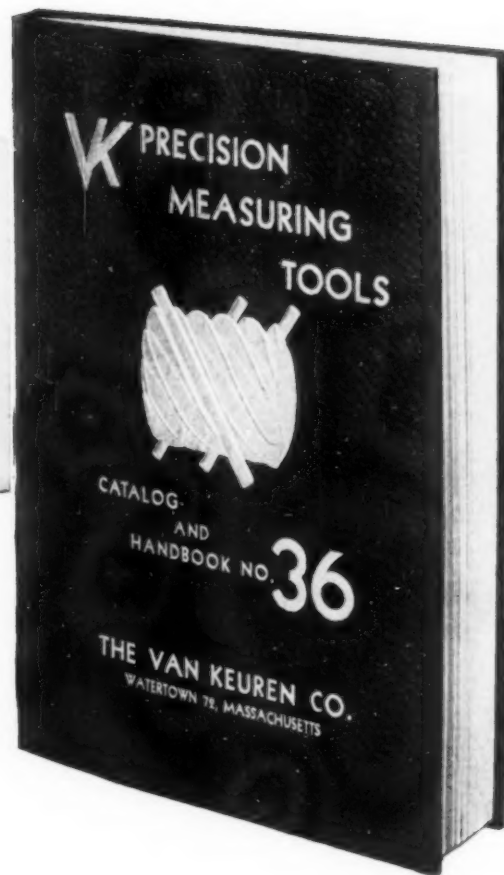
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174 WALTHAM STREET, WATERTOWN, MASS.

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Joe Vuille says it's simple arithmetic:

"180 cups per min. x 60 min. x 40 hours per week x 5 weeks =

**2,160,000 brass cups
in one uninterrupted run"**



From the cup illustrated actual size above, socket shells are produced in eight operations on special equipment, followed by a stress-relief anneal and a final bright-dip.



Socket shell caps like this are formed in an 8-operation multiple-plunger press at the rate of 86 per minute.

Typical of Leviton's complete line of lampholders is this "Electrolux Push Thru" model. Both shell and cap are made of ANACONDA Brass.



For more than 20 years, Joe has been press-room foreman of Leviton Manufacturing Company, Brooklyn, N. Y., one of the world's largest manufacturers of electrical wiring devices.

Multi-million production runs of stamped and drawn products are nothing new to Joe, but he'll admit that there's more to it than a multiplication table:

"First," says Joe, "you start with a good product design. Then the toolroom calls on its broad experience in diemaking. Next, good equipment and good housekeeping are essential in the pressroom. And then there's the brass: these extra-large coils of brass strip have to be just so . . . in dimension, composition, grain size, temper and surface finish . . . lot after lot after lot . . . tailor-made for the job."

Each year Leviton uses many thousands of pounds of ANACONDA Brass, produced to Leviton's precise specifications, "just so . . . lot after lot after lot . . . tailor-made for the job." Perhaps we can perform a similar service for you? Write to *The American Brass Company, General Offices, Waterbury 20, Connecticut*. In Canada: *Anaconda American Brass Ltd., New Toronto, Ontario*.

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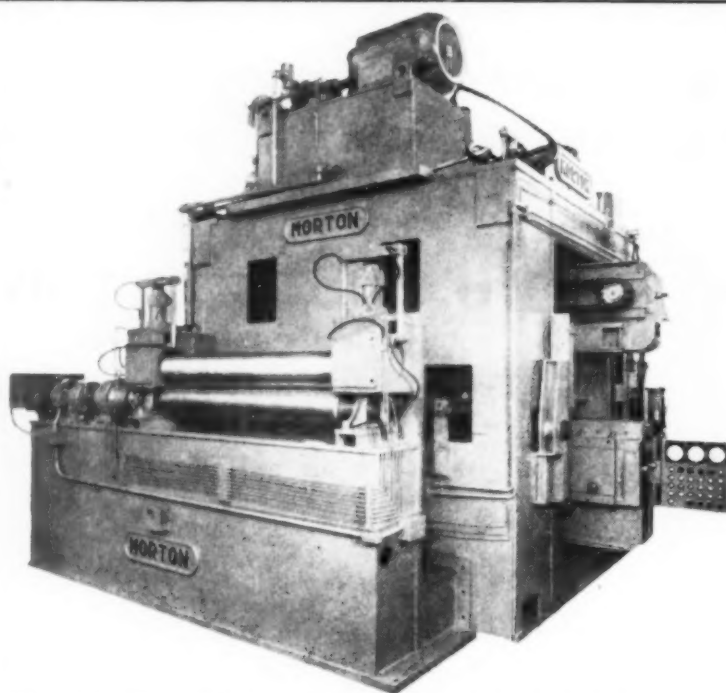
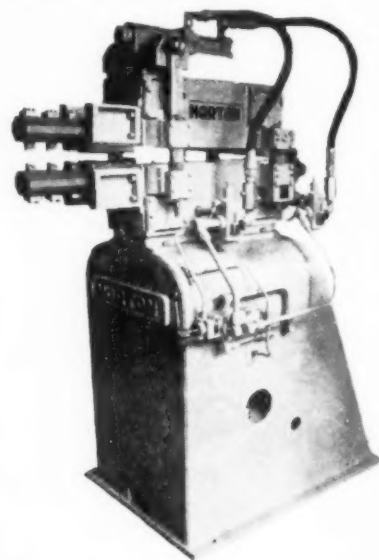


Fig. 3218 THIS MODEL RB is designed for joining the ends of coils in continuous process lines. Galvanizing, Pickling, Annealing and Slitting lines are some of the continuous processes requiring this Morton equipment.

This is one of ten Morton models designed for Shearing, Welding, Trimming or Rolling materials to meet the requirements of Ferrous and Non-ferrous industries.

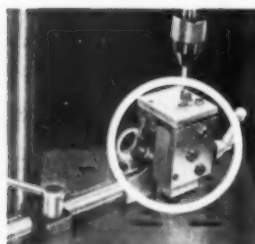
MORTON MANUFACTURING CO. • BROADWAY & HOYT • MUSKEGON HEIGHTS, MICHIGAN

Fig. 4225 A LIGHT DUTY floor or bench type Trimmer having 4", 6" and 8" width capacity and 1/8" maximum metal thickness. Can be arranged for cylinders or strip trimming. When furnished with Morton Automatic Welding Equipments it is tops for many industrial applications.

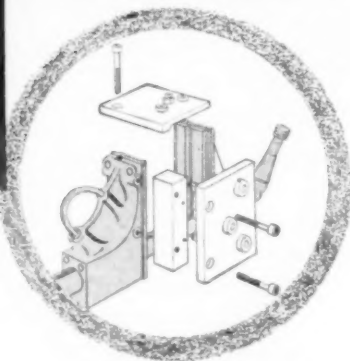


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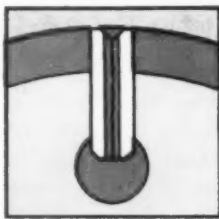


PUMPS 2000 PSI
MOTORS 2000 PSI
DOUBLE PUMPS
PUMPS/VALVES
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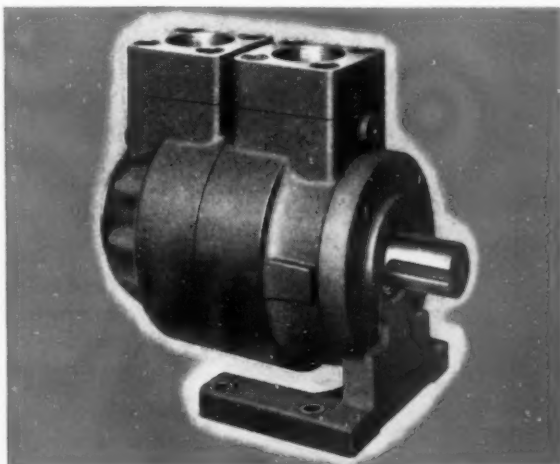
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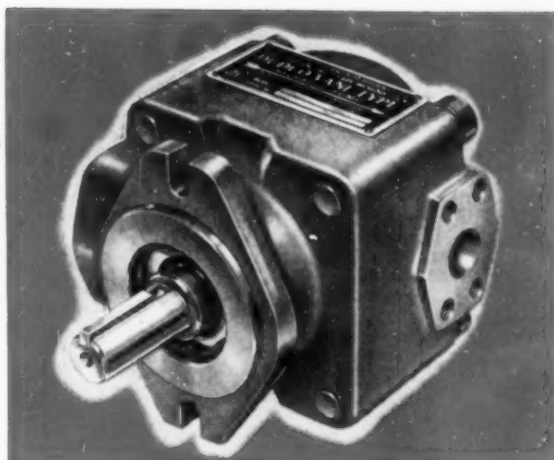


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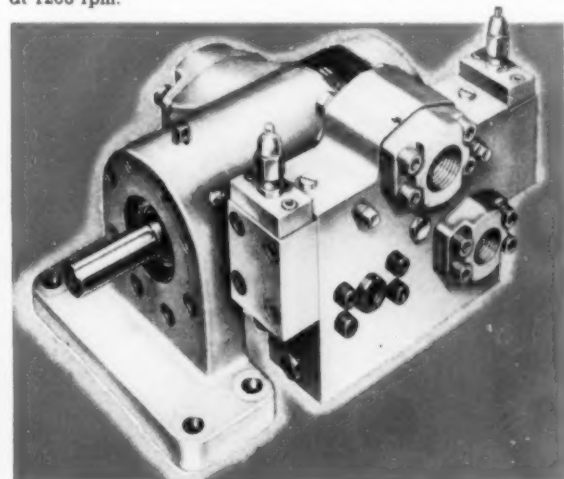
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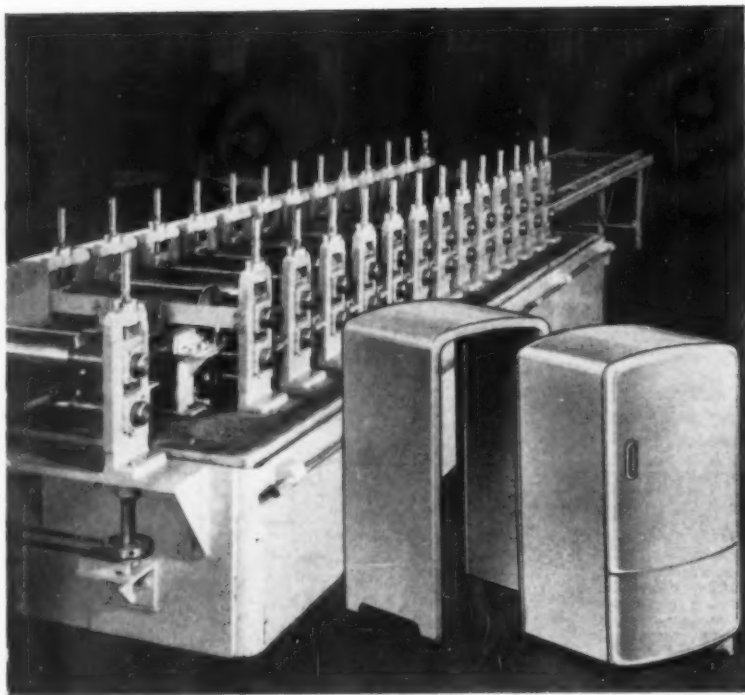
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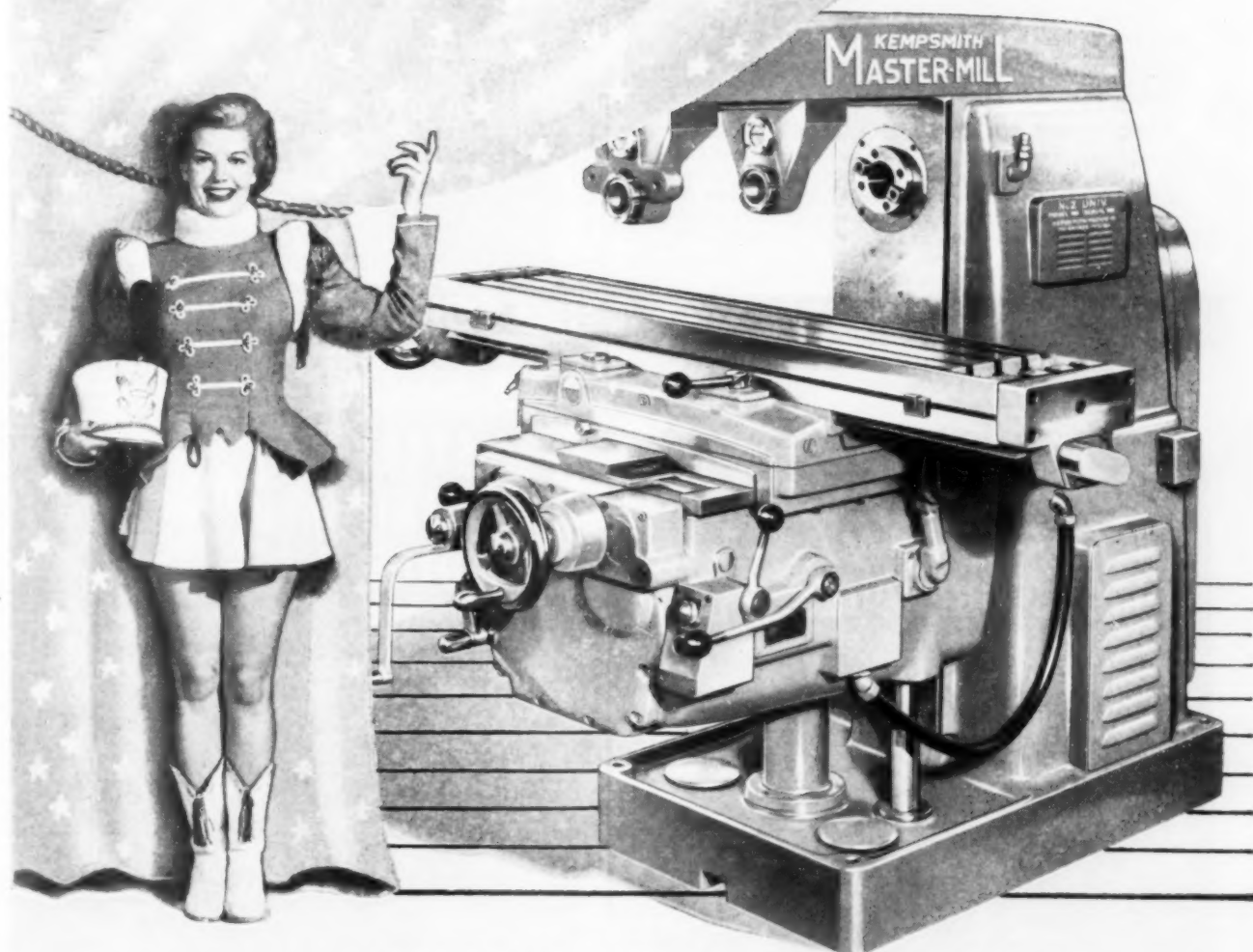
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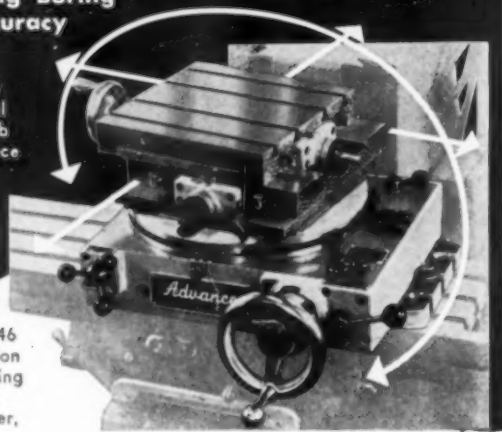
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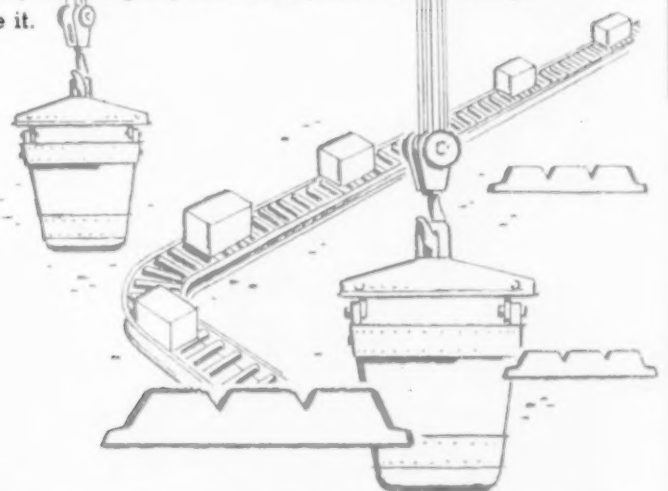
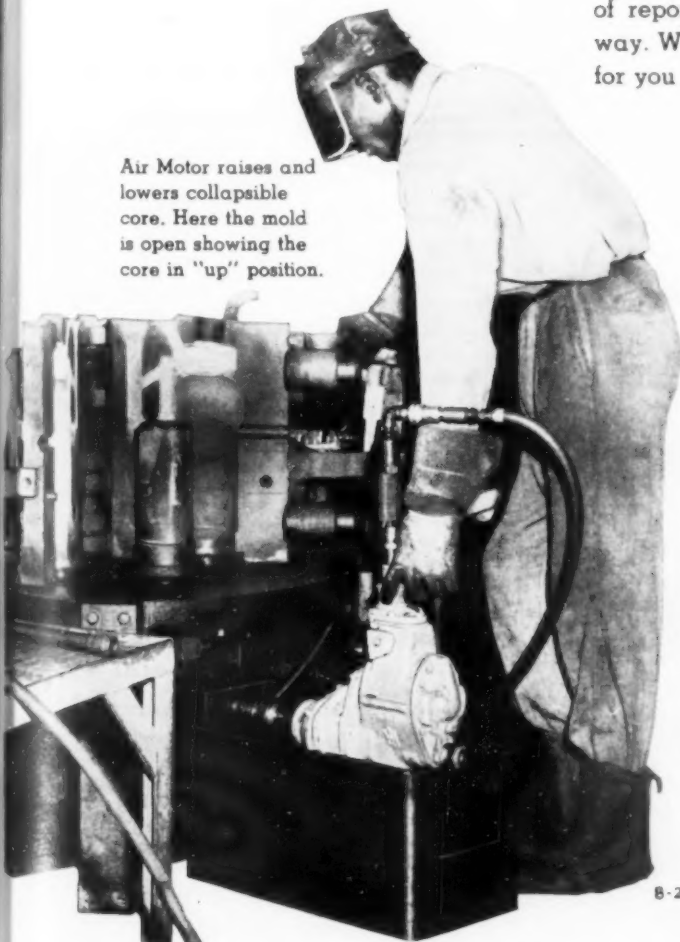
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Air Motor raises and lowers collapsible core. Here the mold is open showing the core in "up" position.



Ingersoll-Rand

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AIRengineering Manual

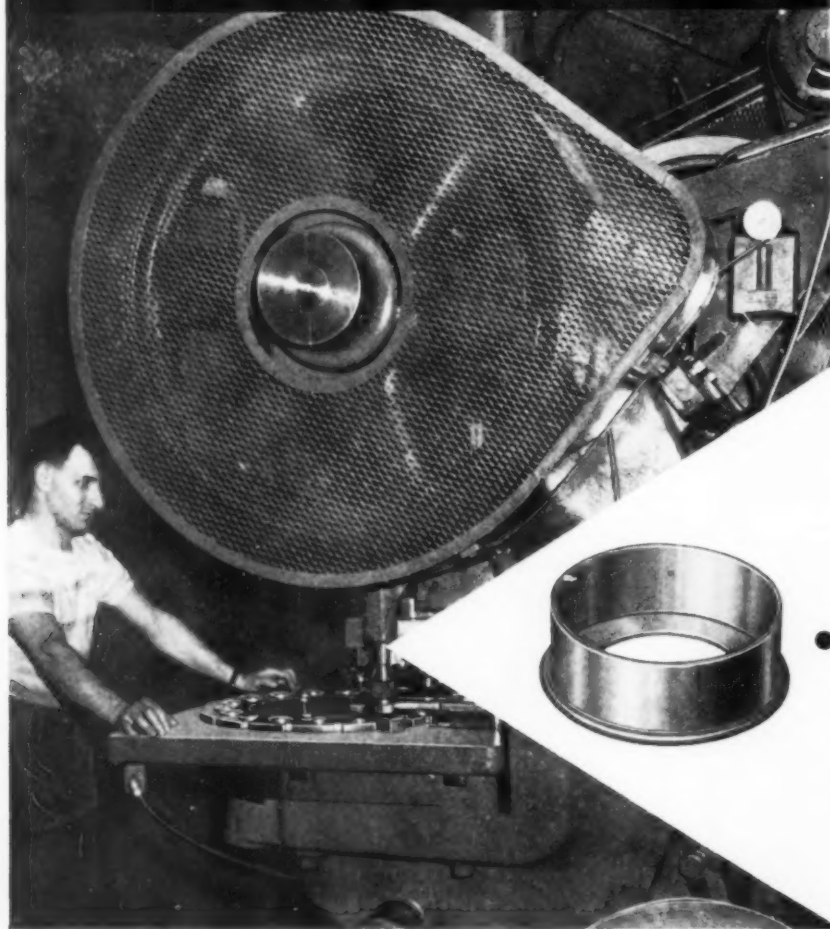
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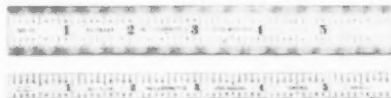


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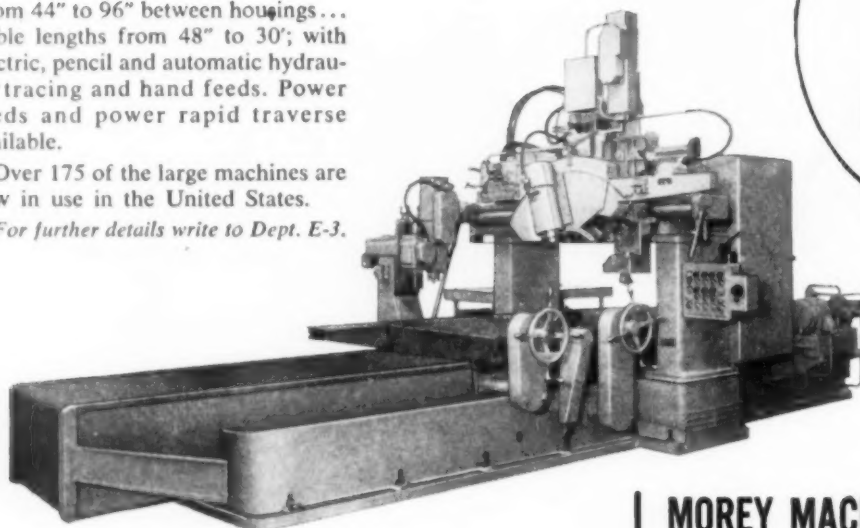
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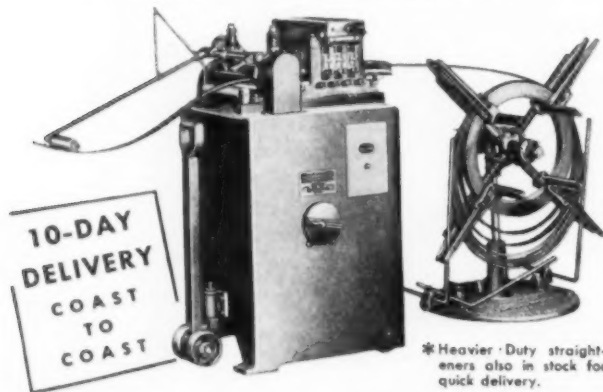
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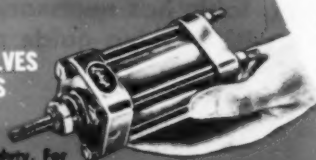


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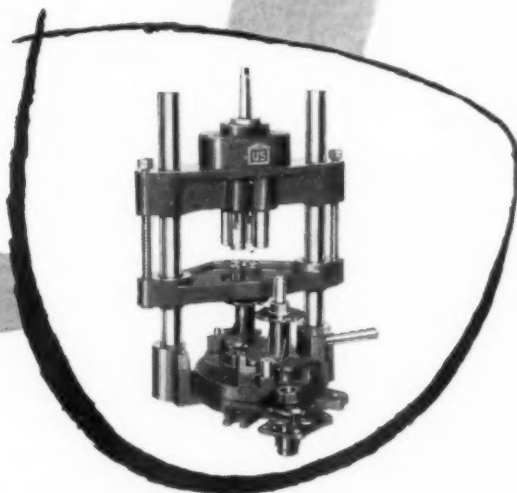
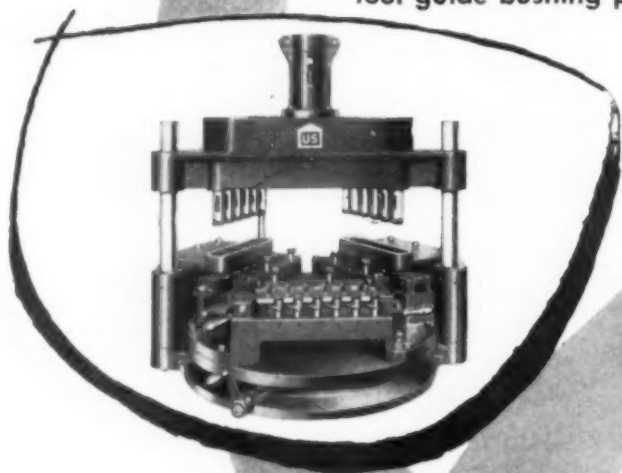
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Shown above is a drill head complete with boring bars with Carboloy-tipped cutters and Stellite wear strips. The indexing table has necessary holding fixtures with bushing guide plate.

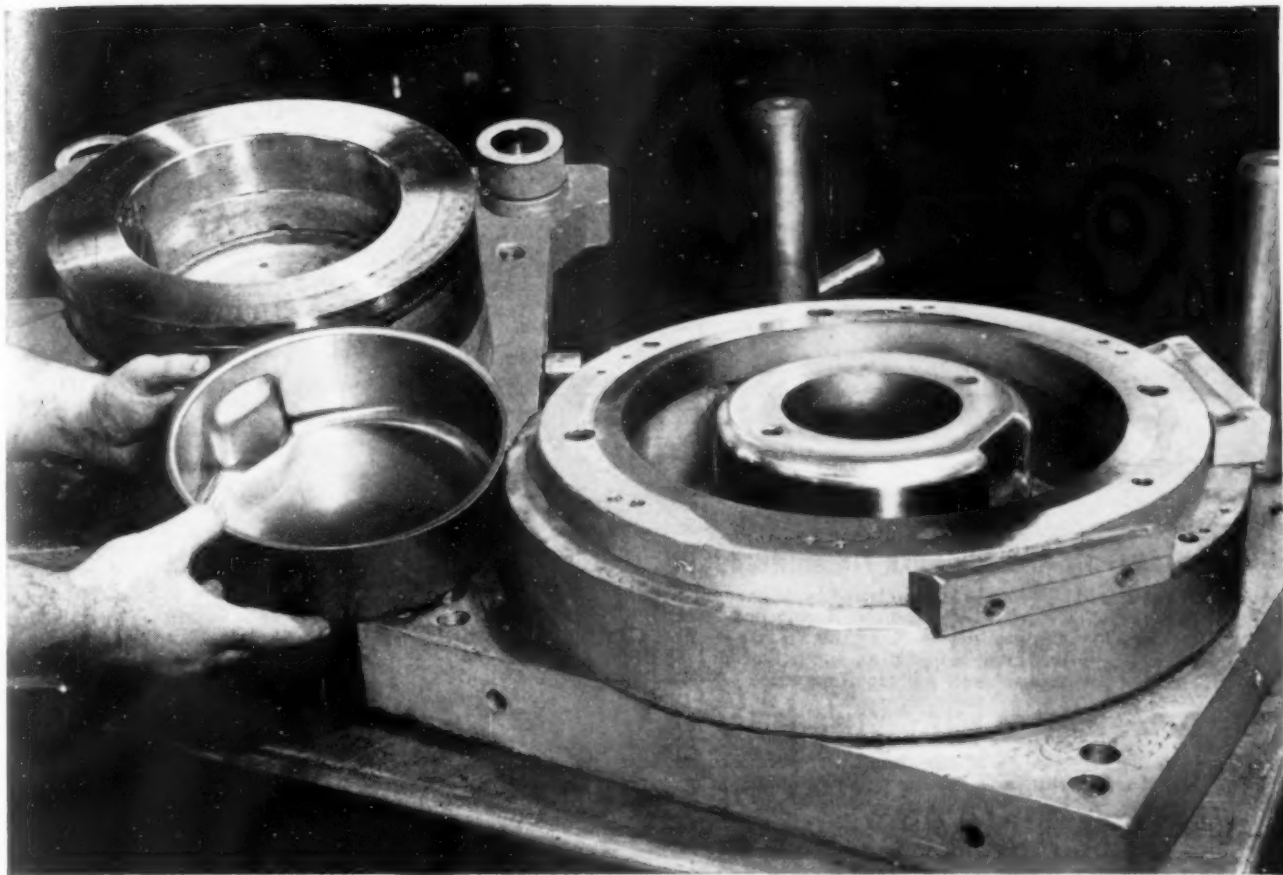
The setup, left, has a two-position, hand-indexed fixture.

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Rejects are held down because Graph-Mo tool steel has a unique structure, diamond-hard carbides, plus unusual ability to retain lubricants on the wearing surface. This prevents excessive scuffing and galling even in tough draws like this.

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Graph-Mo is only one of four graphitic tool steels developed by the Timken Company. For more information about all of their uses in dies, punches, gages and machine parts, send for the new 10th edition of "Timken Graphitic Steel Data Book". Write to: The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

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Are used with conventional equipment or specialized machines for both deep and shallow drilling applications.

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"INNER DIAMETERS



ARE OUR BUSINESS"

Index of THE TOOL ENGINEER Advertisers

September 1955 Issue

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In addition, we guarantee their accuracy to .001 run-out per inch of bar extension from the face of the collet. Balas Collets are not carburized, they are made of high carbon, chrome, nickel, moly, non-warp tool steel. The tensile strength of the threads will exceed 175,000 per square inch.

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Illustrated at the left is a 1 1/4" Balas Collet for an Acme Machine. Note the design and manufacturing quality.

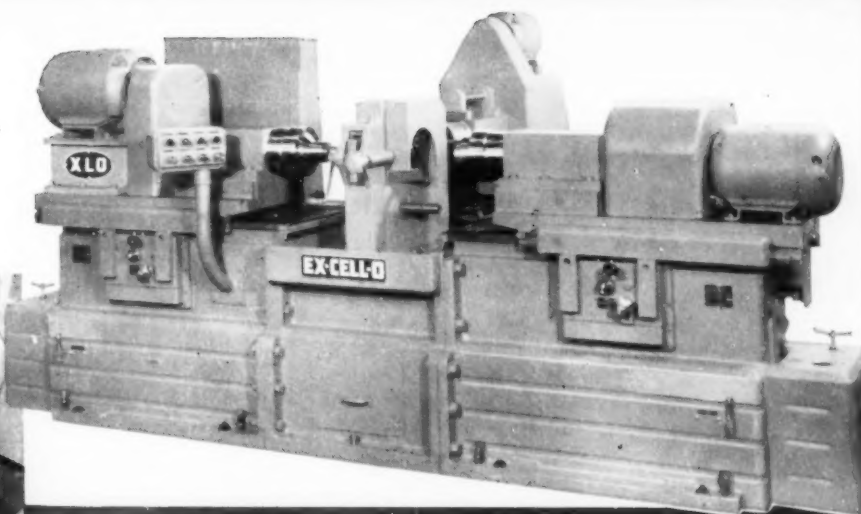
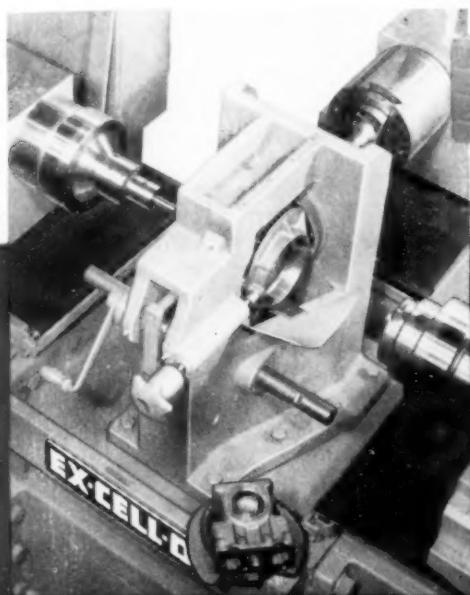
At the right is another brand of collet. See how the threads have been pulled off the body. Imagine the damage that was caused, the time lost in removing the thread from the tube and replacing a new collet.

Balas collet manufacturing co. cleveland 14, ohio

REPRESENTATIVES: George Britton, Brockport, N. Y.; Bert Lewyn, Atlanta, Ga.; L. R. Christiansen Co., Moline, Ill.; Eugene H. Cooper Co., Hopkins, Minn.; Tri-Tex Machined Tool Co., Houston, Texas; Furhs Machinery & Supply, Omaha, Neb.; Harris Fredric & Co., Shreveport, La.; Hoffman Baumruk Co., Philadelphia, Pa.; Hunker & Dixon, Indianapolis, Ind.; Coast Tool Co., Oakland, Calif.; Harvey A. Wolff, Milwaukee, Wisc.; S. B. Martin Co., Cleveland, Ohio; Morris Machinery Co., Newark, N. J.; Paul & Dudley, Glendale, Calif.; John S. Pettit, Madison, Conn.; L. E. Rogers Co., Chicago, Ill.; Scott Special Tools, St. Louis, Mo.; Shively Bros., Inc., Flint, Mich.; Tool Specialists, Westbury, N. Y.; Arthur Williams, Beaverton, Ore.; Iver J. Esbensen Co., Denver, Colo.; T. M. Wolborn Co., Greenville, S. C.; A. C. Behringer, Inc., Los Angeles, Calif.; Machine Tool & Supply Co., Tulsa, Okla.; Alexander & Orlick, Ltd., Brantford, Ontario; Upton Braden & James, Montreal, Canada.

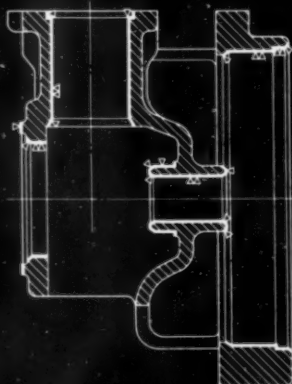
Ex-Cell-O 3-Way Precision Boring Machine. Standard way units—tooled to suit the work.

Note the simplicity of this tooling.



*Cut Costs—
Combine
Operations*

... INSURE YOUR PROFITS in Today's Competitive Market



Heavy lines show the machined surfaces. Small single triangles indicate single operations; double triangles indicate rough-and-finish operations.

Once a part is properly located and clamped, it's good practice to do as much machining on it as possible before it's moved! Related dimensions are held closer, handling time minimized and production increased.

This Ex-Cell-O 3-Way Precision Boring Machine performs 5 roughing and 18 finishing operations on a cast-iron crankcase used in the refrigeration industry. Tolerances are extremely close on the crankshaft and cylinder bores. Net production for the roughing operation is 33 parts per hour; for finishing, 36 parts per hour.

Ask your local Ex-Cell-O representative about all the other advantages of Ex-Cell-O Way Machines—or write today for Bulletin.

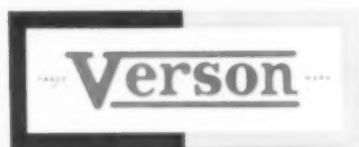


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builds production processes

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Building production processes is Verson's business. Anyone can build a press . . . it's what that press can be made to do as a part of an integrated process that is important. In over thirty years Verson has produced processes incorporating virtually all types of standard and special presses. All of this experience and know-how goes into every press that Verson builds.

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